THE DEVELOPMENT AND EVALUATION OF A COMPUTER-ASSISTED MUSIC INSTRUCTION PROGRAM AS AN AID TO SCORE STUDY FOR THE UNDERGRADUATE WIND BAND CONDUCTING STUDENT

By

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To my parents.

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Abstract of Dissertation Presented to the Graduate School of the University of Florida in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

THE DEVELOPMENT AND EVALUATION OF A COMPUTER ASSISTED MUSIC INSTRUCTION PROGRAM AS AN AID TO SCORE STUDY FOR THE UNDERGRADUATE WIND-BAND CONDUCTING STUDENT

By

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Chair: Dr. Phyllis E. Dorman
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Score study is recognized as an integral component in the instruction of a conductor. However, instrumental conducting courses at the undergraduate level focus on the mechanics of conducting and related areas. The majority of texts on conducting address the topic of score study, but neglect to provide the student with a process or method to follow. Supplemental instruction is needed in order to develop score study skills in the traditional classroom setting. Computer assisted instruction is an effective method of providing supplementary instruction.

The purpose of this study was to (a) develop a computer assisted music instruction program as an aid to score study, using a specific work from the wind band repertoire as a

model and (b) test its effectiveness in improving knowledge of the work as measured by a researcher-developed test. It was hypothesized that students who use a computer assisted music instruction program to supplement traditional classroom conducting instruction in the area of score study will improve their knowledge of a specific wind band score more than students who do not use the program.

Conducting classes at four universities were randomly divided in half, resulting in two groups of 22 students each. All subjects took a researcher-developed test to measure their knowledge of a model work, the First Suite in E-Flat, by Gustav Holst. Following the pretest, the experimental subjects experienced the supplemental treatment for six sessions over a three-week period in addition to classroom instruction in conducting. The control subjects experienced only the traditional classroom instruction. Following the three-week period, all students took the same dependent measure as a posttest.

Results revealed that the Experimental group obtained significantly greater gains over the Control on the total measure and Subtest 3. Results also indicated that there were no statistically significant differences in the gain scores between the two groups on subtests one and two.

It is concluded that the computer may effectively supplement traditional conducting instruction in the area of score study. Further investigation in this area is needed in

the optimal use of technology, in test development, and in conducting curriculum.

CHAPTER 1
INTRODUCTION

Background of the Problem

Score study is recognized as an integral component in the training and instruction of conductors. Knowledge of the standard literature is considered as important as the development of conducting technique. Each student wind band conductor must develop the skills necessary to become knowledgeable about a score. This enables him or her to be an effective conductor of an ensemble. The instrumental wind band conductor who aspires to a teaching position will utilize these skills many times in his or her career as he or she prepares the pieces he or she chooses and communicates those works to various ensembles.

Score study is defined as a "process through which music notation and other information provided in the score are systematically examined and thoroughly assimilated" (Battisti and Garofalo, 1990, p. 3). Upon investigating the content of various writings on conducting, including texts intended for classroom instruction, it is apparent that the majority of these texts emphasize the importance of score study for the conductor. The degree of emphasis, indicated by the amount of attention given to the topic in the text, varies in its

scope as well as in depth. There are also many variations in recommended methods of score study, if one is included by the author. (A review of these writings may be found in Chapter 2.) Accounts of the careers of well-known orchestral conductors (Ewen, 1948; Bamberger, 1965; Schoenberg, 1967) indicate that they spent a great deal of time in score study and memorization.

Score study is a relatively non-standardized and often neglected aspect of music instruction. Battisti and Garofalo state this idea as the premise for their text Guide to Score Study for the Wind Band Conductor (1990). In the preface, they make this point:

> . . . there is a need for instruction and guidance in the area of score study. Experience has shown that many novice conductors learn the craft of conducting before they learn how to study a score. This reversed learning sequence often creates a peculiar situation where a neophyte conductor begins to conduct an ensemble before he or she has developed an interpretive image of the music.
>
> The problem is compounded by the fact that very few books or articles treat the score study process in detail. Although most conducting books adequately cover the techniques of conducting . . . they devote precious few pages, if any, to score study. (p. iii)

Based on this premise, it would seem, therefore, that an inequity exists in the relative importance of score study and the attention given to this topic in available writings and instruction at the undergraduate level. It would then seem appropriate to consider supplementary methods of instruction in instrumental wind band conducting courses at the undergraduate level in order to allow students to develop these necessary skills.

The Guide to Score Study for the Wind Band Conductor is the only text of its kind, as it is devoted entirely to a process or method of score study for the wind band conductor. Therefore, it seems appropriate to utilize this text, along with the suggested method of score study found therein as a model on which to base this study. The writers recommend a four-step process to be followed when preparing a work for conducting. This process may be stated as follows:

1. Step One - Score Orientation
2. Step Two - Score Reading
3. Step Three - Score Analysis
4. Step Four - Score Interpretation

The first three steps of this process may be performed individually by the conducting student as he or she undertakes the study of a particular work. The final step, Score Interpretation, is based on the knowledge gained in the first three steps, and is displayed before an ensemble in a rehearsal situation. Therefore, this step will not be considered in this investigation. Instead, the student will demonstrate the knowledge gained by this process through a researcher-developed test.

Many other conducting texts and references share similar ideas as to the specific elements that should be included in the preparation of a new work by the conductor. These texts and other writings on score study are examined in more detail in the chapter containing a review of the literature (Chapter 2).

The goal of score study is twofold: (1) to develop a familiarity with the work to the point of being able to hear the work in its entirety in the mind, and (2) to develop an interpretation of the work based on the information gained from the score and supplementary sources. The importance of this is expressed in a statement by Battisti and Garofalo:

> To create music on the podium, the conductor must know the score completely and have a clear conceptual image of the piece in his or her mind. When conducting, the priority should be the realization of the mental model of the music and not simply the mechanical execution of the composer's notation. To reach that stage, it is necessary for the conductor to have completely internalized the score through study. If the conductor has not totally consumed the music and formulated an interpretation, he or she cannot create on the podium but can only direct players in the performance of notes. (p. 1)

The development of an interpretation and its accurate measurement are beyond the scope of this investigation. Therefore, the first goal listed above is the focus; that is, to develop a familiarity with the work sufficient to be able to hear it in the mind and recall details at will.

It is often unclear as to how the student is to gain the necessary skills for the realization of this goal. As stated above, the emphasis in many undergraduate conducting classes is often on the technical development of the use of the baton, in communicating with the ensemble through the use of gesture, and in error detection and problem solving. According to Labuta (1965, p. 7), "Most conducting courses are structured to emphasize and systematically present the so-called 'basic techniques.'" The development of the related skill of inner hearing is often under emphasized as

well. These skills must be obtained in the early stages of formal musical training at the undergraduate level, and are usually developed in music theory courses and these emphasizing aural skills development. The skill of problem solving based on an external audio stimulus is addressed in conducting courses. However, the process of obtaining a mental image of what is desired from the ensemble seems often neglected. Labuta points out that the student must have an aural concept of the music as well as the necessary technique to solve the musical problems encountered in rehearsal with an ensemble. "If he lacks the musical conception there will be no sound basis for his technique, or for continued growth in conducting competency. Technique, as a means, remains secondary to the goal of all conducting endeavor--expressive performance" (pp. 78-79).

The concept of audiation is also applicable to this study, since this is precisely what the conducting student must do as he or she studies a wind band score. Edwin Gordon, in his Learning Sequences in Music (1988), discusses the concept of audiation as the basis for music aptitude. He indicates that the level of potential to audiate sound in music is a prime determining factor in the possible level of musical achievement a student may reach. Audiation takes place " . . . when one hears and comprehends music silently, that is, when the sound of the music is not physically present" (p. 7). The process of audiation as one is reading notation is called "notational audiation" (p. 8). This is

defined as the mental hearing of what is seen on the printed page before aurally hearing the sounds. There is a need for further study in this area in order to determine its relationship to the development of inner hearing (ear training) and its subsequent application to conducting. However, it seems clear that this ability is applicable to score study. A more thorough examination of the writings of Gordon in this area may be found in a review of the literature.

Conducting students at the undergraduate level receive instruction in areas of "ear training" or "sight singing". This instruction generally falls into two categories, what Nicolai Malko called "objective hearing" and "imaginative hearing" (The Conductor and His Baton, 1950, p. 2). Objective hearing is the more easily developed, and includes the ability to identify and categorize external sounds. The imaginative hearing is difficult to develop, and instruction usually takes the form of some emphasis on sight singing. This type of hearing is used in the various stages of score study, in which the student attempts to develop a conceptual aural image of the work being studied. Then, as the actual rehearsals begin, the student conductor attempts to match the sounds that are heard from the ensemble with the mental aural image. Both types of hearing are crucial to the conductor and must be adequately developed if the student is to function successfully. The primary focus of this study is the investigation of a supplemental method by which these

skills may be efficiently and successfully developed in conducting courses at the undergraduate level in the area of score study.

Computer-assisted instruction in music is recognized as a valuable tool for learning by many music educators and is used as to supplement classroom instruction at many levels. The computer has been shown to be an infinitely patient and efficient instructor and disseminator of information regarding basic skills and fundamental concepts. The earliest efforts in computer-assisted music instruction (CAMI) were reported during the late 1960s. These early studies were in the areas of pitch discrimination (Kuhn and Allvin, 1967) and ear training for instrumental musicians (Deihl, 1971). The proliferation of the microcomputer in the 1970s brought the feasibility of CAMI to all institutions. Many companies have since developed educational software ranging from instrumental music instruction to music theory and history.

Early studies using computer-assisted music instruction reported improvements in learning efficiency and speed for those students who received CAMI. By 1975, Jones reported 23 of 429 institutions surveyed were involved in some type of CAMI. Specifically, Taylor (1981) reported that CAMI is almost as effective as teacher instruction and "perhaps more effective in drill and practice situations" (p. 34). The reasons for these findings are simple, the computer allows for infinite repetition of a specific drill, and may be

utilized dur[illegible], and in addition to normal classroom instruction. With the appropriate software, CAMI may be tailored to the specific needs of the student. Therefore, the student receives the necessary drill and practice exclusive of valuable class time. This is especially useful for remedial work or as a supplement to the traditional classroom instruction.

Many software programs for a variety of computers have been developed, marketed, and are in use with effective results. CAMI is in widespread use in educational settings, and seems to be a permanent tool for learning in the music classroom. It has been shown to be particularly effective in the area of supplementary instruction, allowing the student to practice skills individually without the extensive use of classroom instructional time.

The majority of the music software programs currently on the market are for drill and practice on specific concepts related to a complete music education. The majority of CAMI software has been developed in the areas of theory, ear training, and history. However, there are specific areas of study in music, such as score study, that require a more comprehensive approach. Only recently has the computer been utilized for supplementary instruction requiring more complex tasks. As there seems to be a need for supplemental instruction in the area of score study, it is possible that the computer may be utilized as an effective tool. With the recent advances and developments in technology and their

applications in music education, the feasibility of more advanced tasks for the computer should be explored.

Statement of the Problem

There are many texts on conducting available to the student, some by well-known conductors, others by instructors at various educational institutions. Most state unequivocally that a thorough knowledge of the literature is essential, but few actually instruct the beginning conductor in how to acquire this knowledge. The majority of content is devoted to instruction in the fundamentals of conducting; beat patterns, gestures, cueing, etc. Various texts instruct the reader to practice careful study of the score until it is completely learned, but neglect to provide a process or method of study. This usually seems to take the form of repeated readings of the work until it is committed to memory. However, there are also texts that treat this subject with more emphasis. These are examined in the review of related literature (Chapter 2).

The conducting courses that utilize these texts also are geared towards the development of the mechanical skills needed for conducting. In 1985, a survey of the College Band Directors National Association examined the content of instrumental conducting courses at the undergraduate level. Among other items of interest, this survey revealed an imbalance in the amount of instructional time spent in the area of score study due to the necessary emphasis on these

basic techniques". (This survey is examined in more detail in Chapter 2)

Therefore, it seems that these skills may not be adequately addressed in the classroom, and that a need exists for the further development of score study skills for the conducting student. This need may be addressed in the form of some type of effective supplementary instruction allowing the student to develop these necessary skills.

Purpose of the Study

The purpose of this study is to (a) develop a computer-assisted music instruction program as an aid to score study, using a specific work from the wind band repertoire as a model and (b) test its effectiveness in improving knowledge of the work as measured by a researcher-developed test.

Two basic questions are addressed: (1) Can the computer be used to effectively supplement traditional classroom instruction in the area of score study? (2) Can knowledge of a specific work be improved for the undergraduate instrumental wind band conducting student through the use of such a computer-assisted music instruction program?

The development of this program is intended to supplement the traditional curriculum of the undergraduate instrumental wind band conducting course with additional instruction in score study. The computer-assisted music instruction program is modeled after the first three steps of the process of score study described in Guide to Score Study

for the Wind Band Conductor (1950). These three steps are (1) Score Orientation, (2) Score Reading, and (3) Score Analysis

As a result of using this program, the student will be able to (1) recall surface information contained in the score, i.e. title, composer and dates, year of composition, number and titles of movements, basic signatures, basic tempi, and approximate time for performance, as well as other significant works by the composer for the wind band medium (Score Orientation); (2) visually identify basic musical elements from score excerpts and place them in the correct movement (Score Reading), and (3) aurally identify musical events of the work, including major themes, specific variations, etc., as well as their location in the various movements along with other specific information (Score Analysis).

An additional purpose of this study is develop a test instrument that will adequately measure a students knowledge of a wind band score. This is necessary in order to determine the level of familiarity with the model work obtained by the student as a result of utilizing the computer-assisted music instruction program as an aid to score study. The test, like the process of score study and the computer-assisted music instruction program, is developed according to the guidelines suggested in the Kottisti and Garofalo text. At this time, no standard test instrument exists for this purpose.

Hypotheses

The primary research hypothesis for this study is that students who use a computer-assisted music instruction program to supplement the traditional classroom curriculum in the area of score study will improve their knowledge of a specific wind band score more than students who do not use a computer-assisted music instruction program. The corresponding null hypothesis is that there will be no statistically significant difference in the posttest scores on the model work between students using the computer-assisted music instruction program as an aid to score study and students not using the program.

Due to the progressive levels of study present in the computer-assisted music instruction program, as well as the progressive levels of knowledge required for successful completion of the test, it is necessary to investigate three additional research hypotheses. These are patterned after the process recommended in the Guide to Score Study for the Wind Band Conductor, to the progression of study recommended to the student in the computer-assisted music instruction program, and to the test utilized to measure the knowledge gained as a result of the instruction.

The first of the additional hypotheses is that students who use the computer-assisted music instruction program designed to supplement the traditional classroom curriculum in the area of score study will demonstrate a greater recall

of the basic surface details of the score (Score Orientation) than students who do not use the computer-assisted music instruction program. The corresponding null hypothesis is that there will be no statistically significant difference in the posttest scores on Section One (Score Orientation) of the test, which requires basic knowledge of surface information contained in the score, between students using the computer-assisted music instruction program as an aid to score study and students who do not use the program.

The second additional hypothesis is that students who use the computer-assisted music instruction program designed to supplement the traditional classroom curriculum in the area of score study will be able to identify visual excerpts from the score and recall specific information regarding each excerpt (Score Reading) with a greater degree of accuracy than students who do not use the computer-assisted music instruction program. The corresponding null hypothesis is that there will be no statistically significant difference in the posttest scores on Section Two (Score Reading) of the test, which requires visual familiarity with the score, between students using the computer-assisted music instruction program as an aid to score study and students who do not use the program.

The third and final of the additional hypotheses is that students who use the computer-assisted music instruction program designed to supplement the traditional classroom curriculum in the area of score study will be able to

identify aural excerpts from the work and recall specific information regarding each excerpt (Score Analysis) with a greater degree of accuracy than students who do not use the computer-assisted music instruction program. The corresponding null hypothesis is that there will be no statistically significant difference in the posttest scores on Section Three (Score Analysis) of the test, which requires aural familiarity with the score, between students using the computer-assisted music instruction program as an aid to score study and students who do not use the program.

Definitions

In order to clarify specific terms used throughout this study, the following definitions are provided for ease of reference. These terms are intended to define the parameters of the investigation in relation to the computer-assisted music instruction program, the score study curriculum, and the researcher-developed test.

Score study is defined as a "process through which music notation and other information provided in the score are systematically examined and thoroughly assimilated" (Battisti and Garofalo, p. 3). Score study is of paramount importance to the conductor, since it is the means by which he or she will "communicate the expressive potential of a musical composition in an effective and efficient manner" (p. 1).

The score study process used and recommended in this investigation is presented as the first three steps of the

method suggested in the Guide to Score Study for the Wind Band Conductor (Battisti and Garofalo, 1990). These steps are (1) Score Orientation, (2) Score Reading, and (3) Score Analysis. The fourth step, Score Interpretation, is the result of the process involving the first three steps and is demonstrated in the ensemble rehearsal. Therefore, it is not included in the computer-assisted music instruction program or as part of the study.

Score Orientation involves familiarization with the surface information contained in a perusal of the score. Specifically, this information includes the following:

1. Title
2. Birth and death dates of the composer
3. Number, titles, and definitions of movements
4. Key and meter signatures
5. Basic tempi of each movement
6. Total performance time of each movement and of the entire work
7. Definitions of various musical terms found in the score
8. Other works for wind band by the composer

This is Step 1 of the score study process, which coincides with Subtest 1 of the researcher-developed test.

Score Reading is the first step in the actual audiation of the work, and involves one or more mental readings of the work at a comfortable tempo. This step may include the use of a keyboard or an audio recording in the event of passages too complex for the student to audiate after one or more readings. The information that may be obtained by observing an excerpt from the score includes the following:

1. Meter
2. Key
3. Voice containing the melody line

4. Predominant texture
5. Predominant dynamic level
6. Changes of key or meter that may be present
7. Predominant style
8. Relative thickness of the scoring.

This is Step 2 of the score study process, which coincides with Subtest 2 of the researcher-developed test.

Score Analysis consists of various in-depth examinations of the work from an analytical standpoint and may include one or more of the following:

1. Analysis of the form
2. Phrase analysis
3. Harmonic analysis
4. Thematic analysis
5. Stylistic analysis

The information obtained in this step allows the student to identify the following:

1. Movement from which the excerpt is taken
2. Musical event, such as a variation, primary or secondary theme or combination of themes
3. Phrase structure of the excerpt
4. Tempo or metronome marking
5. Predominant instrument(s)
6. Whether the excerpt is in a major or a minor mode

This is Step 3 of the score study process, which coincides with Subtest 3 of the researcher-developed test.

Knowledge is defined as the assimilation of the information contained in the score. Knowledge is measured by the degree to which the piece may be recalled in a researcher-developed test.

The independent measure is the computer-assisted music instruction program developed by the researcher using the Hypercard programming application. This is the treatment

used by the experimental group as a supplement to traditional classroom instruction.

The dependent measure is the researcher-developed test, used as the pretest and posttest with both the experimental and control groups. This test was reviewed by the instructors at the various institutions that participated in the study, was used in the pilot study, and was subsequently revised.

Computer-assisted music instruction (CAMI) is defined as a system of instruction that allows access to all necessary information in one self-contained location, the computer. The CAMI program is interactive in that it responds to and requires response from the user.

The computer-assisted music instruction program is developed in an application known as Hypercard, included with all Macintosh model computers. This user-friendly programming package allows the custom designing of software applications. These programs may include graphics and sound with full branching and interaction capabilities without the necessity of learning a computer programming language. For this study, version 2.1 of Hypercard is used, which allows control of the compact disc recording of the model work utilized in the investigation.

The model work selected is the First Suite in E-Flat for Military Band, Op. 28, No. 1, by Gustav Holst (1874-1934). A 1978 doctoral study by Anton Ostling, Jr. identified this piece as one of the first important works by a recognized

composer for the wind band medium. The Wind Repertoire Project of 1988, developed by the University of Colorado, coordinated repertoire lists of eight highly regarded college band programs in the United States. The First Suite In E-Flat was recognized as the most performed piece by the eight institutions in a five-year period. This work is included in many state music lists for band and in the Music Educators National Conference List, and is a well-crafted example of wind music literature as well as accessible to most university level ensembles. In addition, this work is frequently used as a model work for study in undergraduate instrumental wind band conducting courses (CBDNA research study, 1985).

The recording of the First Suite in E-Flat for Military Band used in this investigation is a recording by Frederick Fennell and the Cleveland Symphonic Winds (1978, Telarc CD-80038). This particular recording is chosen due to the extensive research and experience of Fennell with the music of the British school, including that of Holst.

The group labeled Experimental is comprised of one-half of each class at each institution. The "experimental" designation refers to the experimental treatment, the supplemental use of the computer-assisted music instruction program.

The remaining half of each class is the group labeled "Control", but is actually not a true control group. This group receives the traditional classroom instruction alone,

which is also a treatment. However, this designation is used for ease of reference.

Limitations of the Study

To control for sources of internal and external invalidity in this study, certain limitations are imposed. This study only investigates the effects of a computer-assisted music instruction program as an aid to score study and as a supplement to traditional classroom instruction. Score study is limited by the parameters of a standard instrumental wind band conducting course at the undergraduate university level and proficiency is measured by a researcher-developed test.

Due to its widespread availability in colleges and universities, the program development is limited to use with the Apple Macintosh computer. In addition, the program is also limited to the use of the Hypercard programming application, which is user-friendly and available for all models of this computer.

The score of the First Suite in E-Flat for Military Band contained in the computer-assisted music instruction program is the condensed score of the work. The full score is not used due to limitations of disk space, program size and computer RAM memory. However, it is recommended that the student has access to the full score while utilizing the computer-assisted music instruction program.

Students for this study will be undergraduate university music students enrolled in a course in instrumental wind band conducting. In most instances, such a course is the first contact the student has with a formal course of study in conducting. In addition, instruction in score study is generally addressed in the second semester of study. The first semester in the fall of the academic year usually addresses basic conducting skills. Also, the fall semester class may be comprised of both vocal and instrumental students, while the spring semester is the first opportunity for more specialized instruction in the individual areas. However, this schedule may differ from one institution to another.

It is beyond the scope of this study to ascertain the most efficient and beneficial method of score study. This is an area that is in need of more investigation, but may not be fully explored in this study. Therefore, a systematic method recommended by a text specifically addressing the topic of score study (Battisti and Garofalo) and substantiated by a review of the available literature is selected as a guide.

To fully measure the degree to which the student has internalized the recommended score study process for generalization to other musical works is also beyond the scope of this investigation. It is hoped that the student will gain sufficient knowledge and expertise in the area of score study through the use of the computer assisted music instruction program to allow him or her to apply the process

in future study. However, it is [illegible] the ability in this investigation.

The computer-assisted music instruction program is intended only as a supplement to traditional classroom instruction in the area of undergraduate instrumental wind band conducting. It is for the enhancement of knowledge gained in such an educational situation, and is not intended to replace classroom instruction. Also, since the computer-assisted music instruction program is intended as a supplement to traditional classroom instruction in the area of score study in an undergraduate instrumental wind band conducting class, this study is primarily of interest to the instructor of such a course at the undergraduate level.

CHAPTER 2
RELATED LITERATURE

Introduction

This study is concerned with the development and evaluation of a computer-assisted music instruction program designed to aid in score study for the undergraduate instrumental wind band conducting student. Research and literature pertinent to areas related to this investigation are examined in this chapter.

This chapter is organized into five main sections, all of which focus on literature related to this study: (1) score study for the conductor, (2) audiation, (3) conducting curriculum, (4) computer-assisted music instruction, and (5) research studies in educational multimedia. Each section contains subsections which further delineate the various aspects of these topics. The chapter concludes with implications suggested by the review of literature and a summary.

Score Study

Literature addressing the topic of score study is generally found in two areas: (1) texts or other writings specifically related to conducting, and (2) reports of

studies by researchers on the subject of conducting and the related aspects of score study. The review of related literature in this section will focus on the former, and is organized in this manner: (1) historical writings on conducting; (2) early conducting texts; and (3) current conducting texts. A list of available texts and those no longer in print may be found in Appendix C.

Historical Writings

Early writings on conducting say little about score study. However, they are useful if only to emphasize the importance of a thorough knowledge of the literature. Most of the early writings are by well-known conductors, or are accounts of these men by other writers. Practical to the instructor of undergraduate conducting students, they help to place this important area of instruction in the proper perspective.

In these historical writings, specific information may consist of statements such as that supplied by Richard Wagner (1813-1883). "The whole duty of a conductor is comprised in his ability to always indicate the right tempo" (1869, p. 20). Other notable conductors of the past may not offer a great deal more assistance. Hermann Scherchen (1891-1966) stated that "The conductor's conception of a work should be a perfect inward singing" (1933, p. 2). Eugene Ormandy (1899-1974) stated that the conductor must "[illegible] study the score so that he hears it in his mind" (Green, 1987, p. vii).

Sir Adrian Boult (1889-1964) advises the conductor to read through the score several times, working out any unclear details at the piano. David Ewen, in his book Dictators of the Baton (1948), discusses many well-known symphony conductors of this century, some of whom conducted without a score in performance (and sometimes in rehearsals). Of these, Arturo Toscanini (1867-1957) would read through the score several times in order to engrave it on his memory. Leopold Stokowski (1882-1977) engaged in a great deal of score study. The same was true for Dmitri Mitropoulos (1896-1960), Artur Rodzinski (1892-1958), Eric Leinsdorf (1912-1981), and Leonard Bernstein (1918-1990). Ewen's account of Serge Koussevitsky (1874-1951) supplies more specific information. He would first " . . . read the score through from beginning to end, as if it were a novel, gathering general impressions, and acquiring the basic conception of the work" (p. 98). This would be followed by subsequent readings focusing on the harmony and orchestration, playing the parts on the piano, if needed. After reading the score through several times, he would then " . . . mark up every bar and phrase for the exact effect he wished to achieve" (p. 99).

In another account, Ewen (1936) states the necessity of a thorough knowledge of the score: "A conductor should be so intimate with the music he is performing that the slightest markings on the printed page are known to him" (p. 95).

Again, it should be noted that there is no instruction or advice on how to achieve this goal.

Charles Munch (1891-1969) was known for his devotion to the score and the intent of the composer. In his book I Am a Conductor (New York, 1955), he lends some practical advice to the young conductor. His method of study consisted of an examination of the overall structure and the manner in which each section fit together. A deeper examination of each phrase and the significance thereof leads to a harmonic analysis of the primary and secondary elements. The process of delving deeper with each subsequent examination is a common thread in many writings on conducting.

Adrian Boult, another well-known conductor, wrote a short book, Handbook on the Technique of Conducting (London, 1959). A section is included on preparing the score, in which he recommends rapidly reading through the score several times until the overall picture is clear prior to a detailed study. Beginning with an examination of the harmonic detail, the piano is used if it facilitates the process. He suggests a number of ways to progress at that point. The student may examine each page in detail, or each instrument or group of instruments. He makes the point that " . . . the more numerous and various the points of view from which the work is studied at this stage, the more profound is the ultimate knowledge . . . " (p. 33). He then advises an examination of the grouping of bars (phrases). The use of a recording may provide a full perspective on the work.

Some conductors addressed the necessity of score study directly. Conductor Nicolai Malko (1883-1961) draws this comparison:

> For the conductor, the mental side of his work is an absolute prerequisite. Presenting himself before an orchestra or chorus before he has thoroughly studied his score and done the necessary theoretical preparation is like an actor coming onto the stage without having read his lines beforehand. He would repeat the words of the prompter automatically, understanding only later their sense and meaning. (1975, p. 12)

Preceding these writings is a statement by conductor Hermann Scherchen. This emphasis on the importance of score study is supported with a statement made in his Handbook of Conducting.

> More than any other artist, the conductor must be a master mind, with an imagination capable of conceiving and materializing a musical image. Only when a work has come to absolute perfection within him can he undertake to materialize it by means of the orchestra.
>
> We have to distinguish, then, between the preparatory process, by which the conductor evolves the highest possible ideal conception of a work, and the realization in sounds, the actual conducting (which consists in making things clear to the orchestra and in achieving the performance of the work). (1933, p. 1)

Through these accounts, it is evident that well-known conductors of the past considered score study an important part of their work, and necessary to the student of conducting. It is also evident that these writings and accounts include little in the way of practical information for the student. Therefore, in order to obtain more pedagogical information, it is necessary to turn to writings conceived for the purpose of instruction.

Conducting Texts

There are many texts available on the subject of conducting. Labuta (1965) noted that most of these dwell on the so-called rudiments of conducting, or basic baton skills. Readily evident in an examination of these treatises, most do offer some guidelines or at least a suggestion on a method of score study. Many of these books were intended as class texts or methods for beginning conductors or those who wish to further their skills as a conductor. These texts are listed in Appendix C.

Early Conducting Texts

With the goal of developing an interpretation of the music to be performed, Gehrkens (1919) recommends "... careful, painstaking study of the work to be performed, so as to become thoroughly familiar with its content . . to discover what the composer intended to express (pp. 37-38). The author goes on to discuss areas of importance in the development of an interpretation such as tempo, dynamics, and the like, but does not recommend an actual method of study to be followed.

Stoessel (1918) provides a method of score preparation "generally used by modern conductors" (p. 92). This method includes these headings (p. 92):

1. The architectural or general impression
2. Detailed study of the individual parts
3. Detailed study of individual sections

4. Mental hearing of the composition in parts and as a whole

5 Piano transcription as a means of checking np end ratifying the mental concept

Although an actual process is supplied by the author, little information is given as to the specifics of each of these elements The author recommends the piano not be used during the first perusal of the score, but be reserved for later readings. He emphasizes the importance of developing the abilllty to hear the work without the aid of an instrument other than the enral imagination. The piano should be need only to verify and confirm what the eye has seen and translated into the inner hearing.

Gal (1924) suggests reproducing scores on the piano as a prelude to reading, beginning with easier string quartets and symphonies. For more difficult works, it will he necessary to "study every detail" (p. 41), attempting to imagine the sound as closely as possible

Berg (1927) first advises a perusal of the score to discover the intent and spirit of the composition, and to determine methods of interpretation. Following this, the score should be marked to indicate potential problem areas for the ensemble He then notes the phrasing, nuances, and bowing and breath marks. All of this is for the purpose of leading to a " deeper conception and firmer grasp of the composition . . " (p 85). However, despite the advice given, the process is still nebulous at best for the beginning conductor.

Carse (1929) makes no attempt (by his own admission) to consider the art of conducting from an interpretive point of view, rather to deal only with the technique of conducting. However, it should be noted that he approaches the importance of score study from the standpoint that the conductor cannot simultaneously read the score and aurally analyze the sounds from the ensemble. "The function of a conductor is primarily to control the playing of an orchestra, and this takes up all his attention; there is no spare time to give to deciphering a score" (p. 37)

Rakalainikoff (1938) warns against the conductor coming to rehearsal unprepared and learning the piece along with the ensemble. He labels this practice "disgusting" (p. 9), and stresses the learning of the score ahead of time by the student. The slightest markings must be known, as well as a finished plan in mind before appearing before a group. The only practical advice on how to achieve this goal is the direction to read every measure of the score from top to bottom. If this is done, the student " . . . will never miss one minute detail" (p. 16).

Gordon Jacob, a well-known composer of music for the wind band, uses the phrase "see with the ear and hear with the eye" (p. 39) in his book How to Read a Score (1944). To accomplish this, he recommends reading all the notes in the score, taking complicated passages to the piano and playing them in time, even if slowly. Passages that remain unclear should be marked for further study, and a recording should be

used if one is available. Prior to this, the aim should be to hear in the mind, the "aural imagination", the sound of the various instruments. In this manner, "A full score will gradually come to be to you what it was to the man who made it, a veritable picture of subtle sound-shapes" (p.41)

One historical writing stands out as an example containing detailed, step-by-step instructions for the conductor. In his text Techniques of Modern Orchestral Conducting (Cambridge, 1956), Benjamin Grosbayne suggests a definite procedure for studying a score that includes twelve steps: (pp. 193-194)

1. Inspect the instrumentation, clefs, transpositions, and terms used.
2. Sing through all parts horizontally as they sound.
3. Sing through the parts up and down starting from the bottom.
4. Analyze the architecture of the piece with special attention to transitions and development sections.
5. Analyze the figures, periods, and phrases.
6. Analyze the harmony, modulations, counterpoint and themes.
7. Analyze the changes in timbre, noting potential problem spots.
8. Analyze changes in dynamics horizontally and vertically.
9. Combine the previous categories and note how they intertwine.
10. Consider the tempo and mood of each section and in relation to other sections.
11. Conduct through the work and note potential problem areas.
12. Research what others have written about the score.

This step-by step method gives the student an excellent idea of the process of score study and the elements thereof. The text by Grosbayne seems to be the first that contains a detailed, systematic process of this depth, and even today is one of the more descriptive treatises on the subject.

Dolmetsch (1957) advises the student to first look through the score from the bass upwards in a general way (this would indicate an overview or perusal) and then play through the score on the piano in order to hear the harmonies and to further his (the student's) knowledge. The form of the work should be examined with attention to the climaxes that should be brought out.

More information is supplied in a text by Krueger (1958). The first job of the conductor is to discover the style of the work or that which sets it apart from others. An examination of the motion generated by the framework of rhythm, melody, and harmony, then consideration of the " germinal themes and their harmonic garb . " (p.177) follows. He then spends 18 pages in a discussion of texture, which he defines as " . . . the general constitution of a tonal fabric . . ." (p. 177), and closes with a brief mention of the overall form, tempo, accent, and tension. These seem to be governed by the aforementioned element of texture, a firm grasp of which will indicate the correct elements that follow. The undefined and vague nature of the process recommended by this author does not seem to be suitable for the conducting student in the early stages of instruction,

but would rather confuse and hinder the search for a viable method of score study.

Bowles (1958) recognizes that the student cannot take in every note of a score as it is read, nor can any but the most gifted conductors. He emphasizes mastery of the score through " . . . progressive effort and experience" (p. 167). However, the practical information is again limited. He recommends making a piano reduction of the score, or possibly recopying the full score from the parts. The use of recordings is also advised, with the caution that this tool not become a substitute for careful study. Overall, the remainder of the book is devoted to other considerations for the conductor, many of which will be helpful. However, this also lacks a thorough treatment of the subject of score study.

Blackman (1964) takes the novel approach of interviewing a number of conductors on their views of the responsibility of the conductor. A frank discussion follows, which includes the history and necessity of the conductor to his preparation and technique. In regard to score study, the author treats this subject in relation to the above topics. He does not supply a straightforward listing of steps in a prescribed method, but does emphasize the importance of this area for the conductor. Those interviewed are also enlightening in regard to the emphasis each places on this subject.

Kahn (1955) indicates that the student must " . . . absorb all the minute details of a score . . . (p. 127)

before he can form an interpretation. The only suggestion offered as a method of accomplishing this is to play the score at the piano while using one's "inner ear".

With the exception of the text by Benjamin Grosbayne, these early writings offer little of a practical nature to the modern conducting student. While all emphasize the importance of score study for the conductor, they do not supply a formal process by which the conducting student may learn to study a score. It should be noted, however, that these were written during a time in which formal classroom instruction in conducting was not the standard method of becoming a conductor. Rather, these men and their students were usually involved in some sort of an apprenticeship as each prepared himself to conduct a musical ensemble.

Current Conducting Texts

We now enter a group of texts that were written for classroom or individual instruction. These writings generally offer more information in the form of methods and procedures for score study as well as the normal discussions of baton technique. Many of these texts are commonly in use in instrumental wind band conducting courses at the undergraduate level.

Preceding Grosbayne (1956) were the writings of Nicolai Malko, a Russian conductor and teacher of conducting who became an American citizen in 1946. His writings have been translated into English, then updated and supplemented by Elizabeth A. H. Green. The original book by Malko was

entitled The Conductor and His Baton, published in 1950, was aimed at the professional conductor. Green has authored two texts, the first intended to be a parallel to the Malko writing, but adapted to the college textbook approach. This text, The Modern Conductor (New Jersey), published in 1968, has undergone subsequent revisions and is widely used as a conducting text at the college level (CBDNA survey, 1985). It contains a balance of material pertaining to the mechanics of conducting and the score. The section dealing with the score is predominantly mechanical as well; focusing on the orientation of the student to various types of scores. Green's recommended method of score study includes an extensive set of instructions for marking the score which will be omitted for the purposes of this study. The steps pertaining to score study are as follows: (pp. 136-137)

1. Check the instrumentation needed
2. Check tempo indications, signatures, and clefs
3. Check transpositions
4. Glance through the work, noting form, solos, and climaxes
5. Follow the melody line throughout
6. Make an analysis of the phrase structure
7. Check doublings and adjust dynamics for the sake of the melody
8. Read through each part separately, noting changes
9. Mark necessary cues in the top margin
10. For the purposes of correlation, read the score upwards measure by measure from lowest stave to highest.

Green's checklist is basically the same as the one supplied by Grashyne, but is ordered slightly different and not quite as in-depth. However, the overall degree of correlation is high. Green follows this list with a recommendation that the student examine The Conductor and His Score (New York, 1978), which is the second text mentioned above, for more detail on score study. Based on the writings of Malko as well, this book was written to be a follow-up to the first. A good deal of material is devoted to the question: "How does one study score?" (p. 13). However, this text is less practical to the student than the first in that it does not offer a step-by-step procedure.

Green first recommends a look at the instrumentation, followed by a read-through of the score in a general manner (a perusal or overview), which includes the overall structural characteristics and form. An analysis of the phrase structure is next, followed by an examination of the harmony. At some point, which is left unclear, ". . . the conductor must learn the music itself, the notes on the page" (p. 13). Malko recommends the piano and/or a recording be used, taking caution that imitation does not take over. The emphasis is on understanding the content and spirit of the work, but how this may be accomplished is never fully defined.

Fuchs (1969) presents an unusual writing on conducting that is unlike any other. Although not a textbook by the author's own admission, this book contains some valuable

information on the preparation of a work by the student. The author uses the phrase "complete familiarity with the score" (p. 34), as do other writers, but Fuchs stresses the importance of a procedure by which this may be accomplished. The primary element to be examined should be the formal structure of the work, first in larger forms such as the introduction and exposition down to the smallest details of phrases and individual measures. Examination of the leading voices, subsidiary voices, and counterpoint should be included as well. After this stage, an analysis of the harmonic details should follow, with the depth of study dependent upon the nature of the work. The use of the piano is also recommended at this point, with attention to the elements of texture and timbre. Finally, a recording of the work may be used as an aid to gaining a complete sound-image of the piece and as an aid to memorization. Although presented in brief and not placed into a step-by-step process, this procedure does offer some helpful advice to the student.

Long (1971) emphasizes baton technique, but also includes a process for the student on the subject of learning the score. This basic procedure, which has been effective for many conductors, includes the following six steps (pp. 60-61):

1. Know about the composer and the relation of the particular work to the overall output.

2. Study the form in great detail, including motif, theme, phrase, section, and movement or entire work.

3. Study the melodic and rhythmic content, being able to sing themes, countermelodies, rhythmic motifs, etc.

4. Know the harmonic content, being able to imagine the progressions in the "inner ear".

5. Be aware of dynamic changes, accents, and other indications of nuances.

6. Try to imagine increasingly large sections in the mind.

Although not as detailed as other texts, Long provides a procedural method which enables the student to become familiar with the score of a work.

The Beginning Conductor (New York, 1972) by Hugo Marple is an instructional text that is obviously concerned with assisting the student in both the mechanics of conducting and the aspect of score study. The importance of this is illustrated in a statement in the Preface: "Unlike many texts on conducting, this one helps the young conductor in learning to read and study a score in preparation for his conducting duties. To teach this skill at the same time that baton technique is being developed is important" (p. xiii). To this end, the author has integrated instruction regarding the score along with baton techniques throughout the text. There are also sections and chapters devoted to this topic alone. The integration becomes progressively more involved as the student obtains the necessary skills in order to master the new information. Although this arrangement seems to be very helpful to the student, the application lacks the actual method or step-by-step process that may benefit the student even further. The information contained is valuable, but the

specifics of score study are not made clear. It should be mentioned that the suggestions made by the author do include many of the same elements found in other writings, including signatures, structural considerations, and phrasing, but these are not examined at length.

A similar approach to score study is presented by Ross (1976). Ross, however, deals exclusively with the score in a mechanical way, discussing only items such as transpositions, clefs, formats, notation, and the like. These sections are termed score reading, which is only one element of score study. In a more detailed examination of this particular area, the text is useful. Of particular interest is a list of suggestions addressing techniques for practicing score reading. These techniques are presented with the desired end result of obtaining " . . . an ability to hear the printed page in the mind's ear, to hear not only the correct pitches and rhythms, but also the correct relationships of timbre, dynamics, and all other aspects of the finished sound" (p. 47). The student who has these procedures for study " . . . will greatly improve their score study ability" (p. 47). Elsewhere, the author mentions other aspects of score study, such as acquiring a historical perspective of the composer and his output, and the place of the work under study in the repertoire. The remainder of direction is to thoroughly learn the score prior to rehearsal in order to hear it in the mind and then rehearse the ensemble toward achieving the same sound.

A book by Ostglis (1977) addresses the manual technique of conducting. A complete knowledge of the work under study is very important to the conductor. "The musicianship of the conductor must encompass the ability to hear the composition as the composer did. He must comprehend and recreate the score in all its details" (p. 3). Although this implies a thorough study utilizing some method or process, the author offers no advice on how to accomplish this.

Hunsberger and Ernst, of the Eastman School of Music, were responsible for revising the conducting curriculum at that institution and subsequently prepared a text utilizing the organizational and instructional materials that were developed. The curriculum attempted to integrate score study with the development of technique. The resulting text, The Art of Conducting (New York, 1983), includes a chapter that divides score study into three phases. Each phase includes several sub-headings, each with concise instructions, as shown below, resulting in a systematic approach for the conducting student to follow (pp. 192-197)

Phase One: Title Page and Overview

1. Composer
2. Title, opus number
3. Dedication
4. Instrumentation
5. Transpositions, clefs
6. Tempo indication
7. Expressive markings

8. Dynamic markings

9. Text, if any

10. Publisher

Phase Two: Large Structural Features and Performance Problems

1. Formal design

2. Melodic development

3. Harmonic organization

4. Rhythmic development

5. Textural and thematic organization

6. Performance problems

Phase Three: Style Differentiation

1. Compositional techniques, Orchestration devices

2. Interpretation

3. Conducting decisions

4. Marking the score

The accompanying descriptions and examples in each heading and sub-heading lend a great deal of specificity to the process, one that a student in the early phases of instruction may follow easily. The authors also include a sample of this process, using a printed score of a choral work by Gustav Holst as a model. The Art of Conducting is a popular conducting text at the undergraduate level (CBDNA survey, 1985).

Kohut and Grant, instrumental and choral instructors, respectively, at the University of Illinois at Urbana-Champaign, have co-authored a text, Learning to Conduct and Rehearse (New Jersey, 1990) This text contains a great deal

of practical information for the conducting student, including basic techniques through advanced rehearsal procedures, excerpts for practice, and a section on score study. The actual procedure may be similar to those already examined, but is different in the elements included in each heading. The outline appears below. (pp 88-95)

Initial Overview

1. Composer information, using all available resources
2. Surface information about the work, including the occasion for its writing and program notes, if any
3. Type of work (harmonic, contrapuntal, atonal)
4. Overall form
5. Melodies and proper tempi
6. Changes in signatures, tempo
7. Sightsing aloud each line, using the piano if necessary
8. Play through all parts in combination on the piano

Next, the authors recommend the use of one or more recordings of the work with and without the score in the interests of saving time and making the assimilation process easier for the student. A phrase analysis and melodic interpretation is next, followed by a chordal analysis and the audiation of each chord from bottom to top. Using a system of beaming to organize divisions and subdivisions of the beat into rhythmic groups provides a rhythmical analysis. This system was devised by the authors and is exclusive to this particular text

The Grammar of Conducting (1980) by Max Rudolf, former conductor of the Metropolitan Opera Company in New York, is a well-known text (CBDNA survey, 1985) which deals primarily with the mechanics of conducting. However, in the chapter "Score Study and the Preparation of Orchestral Materials", Rudolf gives attention to the aspect of score study as a component of conductor training. He first recommends a perusal of the score, followed by a form analysis. An investigation of the harmonic and contrapuntal structure, or of the tone row in the case of serial compositions, is next. Finally, the orchestration is studied, noting what each player is doing at any given moment. Although this system is helpful as a guide to the student, it may not be as practical as other texts reviewed.

Linton differs in his approach in that he devotes the entire first chapter of his book, Conducting Fundamentals, (New Jersey, 1982) to the element of score study, or preparation. He defines score study as " . . . thoroughly learning the music from the standpoint of a conductor" (p. 3). The idea of discussing the topic of score study before basic baton technique is rare in these texts, and serves to emphasize its importance. The author then supplies a general model for score preparation. This model includes the following elements: score reading, musical analysis, conducting analysis, and conducting practice. The component of musical analysis receives the greatest attention, and includes sample questions in the following areas:

organization of rhythm, pitch, and texture, form, style, and dynamic scheme. The other components are also discussed, but not with the same attention to detail. The remainder of the text is devoted to more mechanical instruction, with many musical examples for illustration and practice.

In the book, Score and Podium (1983), Frederick Prausnitz treats the subject of score study in depth as a prelude to the mechanics of conducting. He presents each successive level of score study as an accompaniment to a deeper level of the conductor's role on the podium. The first area deals with the surface of the score and the information readily obtainable there. He then progresses through a reading of the score, attempting to hear the music in the mind as well as remember the look of the printed page. This is followed by a more thorough examination of details of form, structure, phrases, orchestration, and so on. In this regard, Prausnitz's method of study is much like that suggested by others, but discussed in more detail. His text is exclusive in its approach to presenting the material of score study consecutively with that of the mechanics of conducting. This integrated approach should be more beneficial to the student, but in practice is somewhat confusing. The information is more suitable to perhaps an advanced conducting student.

The Modern Conductor (1987) by Elizabeth A. H. Green, is a standard text for undergraduate conducting students. The author gives a step-by-step outline on how to approach the

score. This process is stated in four parts. (1) an overview of the work, noting clefs, transpositions, signatures, instrumentation, and a page-by-page perusal; (2) an examination of the melody line throughout as it progresses from instrument to instrument, (3) an analysis of the phrase structure, and (4) an examination of each individual part separately. Included with this process are suggestions on how to mark the score for ease in reading it during the rehearsal process.

Labuta, in his Basic Conducting Techniques (New Jersey, 1989), includes a module on score analysis. In this text intended for the conducting class, he suggests three basic steps: (1) Acquire a conception of the music, (2) Anticipate problems of conducting, and (3) Anticipate problems of ensemble and rehearsal (p. 64-67). The first step is the one that involves the actual study of the score as related to the familiarization of the work. This step consists of ten components as follows:

1. Instrumentation and score order
2. Transpositions and clefs
3. Terms and tempos
4. Formal analysis
   a. phrases
   b. overall design
   c. thematic material and usage
   d. harmonic structure
   e. architectural design

5. Dynamics
6. Texture and timbre
7. Phrase types
8. Historical considerations for interpretive validity
9. Sing through each part, then arpeggiate chords
10. Play the score at the piano and listen to recordings

Labuta's process is much like that of Green (1965), Munsberger and Ernst (1983), and Kohut and Grant (1990). He provides a detailed and systematic process outlined step-by-step for the student to follow. Each text involves a continuing process of delving deeper into a score chosen for study.

Curtis and Kuehn, (1992) in their text A Guide to Successful Instrumental Conducting, outline an excellent method for the beginning conducting student covering baton technique and basic familiarization with the layout of the score. However, little discussion is devoted to score study, in this case just over one page. The authors do suggest a simple process to the student, but admit that it is not meant to be an in-depth method of score examination: "Please note that this is only a superficial outline, it does not deal with the specific details in score study . . ." (p. 88). They suggest a look at the score to determine whether it is a transposed score or one in C, and to establish the instrumentation, dynamic level, form, style, key, and tempo. This is followed by a "walk through" of the work, paying attention to changes. A more detailed analysis is next,

taking note of cadence points, necessary cues, and the aforementioned changes. The authors state; "If necessary, study the composition a third time . . . " (p.89), this time noting potential problem areas in rehearsal. The intent of this process is to lend a basic understanding of the score to the student.

One book that stands out as different in its focus is the text Guide to Score Study for the Wind Band Conductor (1990), by Battisti and Garofalo. The authors present a systematic process for the examination and assimilation of the information contained within a score. This text is the only specific guide to score study for the conductor. The authors attempt to define the process of study so that the conductor may ". . . know the score completely and have a clear conceptual image of the piece in his or her mind" (p 1). They propose four sequential steps in the preparation of a score by a conductor.

The first of these is a perusal or orientation of the work in an attempt to gain an overall perspective of it in its entirety. This includes all surface information contained in the score, such as biographical information of the composer, background of the composition and all other information readily obtainable. Meter, tempo, instrumentation, key, repeats, and signatures are some of this information. The initial examination of the score should be to determine only these basic elements

The second step of score study involves a mental run-through of the piece, called "reading the score" (p. 22). This is essentially a look through the score at a comfortable tempo, noting the melodic line, rhythmic patterns, climaxes, and other musical events. This process should be done as many times as necessary in order to obtain a clear image of the overall effect of the piece. Sections that remain unclear after several of these readings should be noted for further examination, but not scrutinized at this time. Other texts examined in this chapter recommend using the piano as a tool at this point, while others suggest that it is better to develop score reading skills without resorting to the piano as a "crutch". The reality is that few students at this level would have the ability to "hear" the score merely by looking at it. Therefore, the piano will be an excellent tool at this step, provided the student is sufficiently proficient. Listening to recordings of the piece, if available, should also be done with caution. While they may help to quickly lead a more complete impression of the work, the goal at this stage should be to allow the mind to develop its own impression of the work as a whole and not to adopt the interpretation of another conductor.

The third step in score study involves a more thorough analysis of the work on many levels. This step may include one or more of the following analyses: phrase, form and structural characteristics, harmonic (if practical), and stylistic.

The fourth and final step is a synthesis of the first three steps. The student attempts to draw together all of the information gathered and form an interpretation of the work based upon the knowledge obtained during the study process. It is at this point that the student makes decisions on the actual conducting of the work. The entire process culminates in a complete image of the piece along with the ability to communicate its essence to the ensemble. Guide to Score Study for the Wind Band Conductor may be the best text to provide a practical and effective process for any student of conducting.

Despite the variety in the method and the order of elements examined, the practice of progressive levels of examination during each subsequent reading of the score seems to be a common thread in texts on conducting. Many of these writings share the four-phase method that includes (1) an examination of the surface information and a perusal of the score, (2) readings of the score for the purpose of developing familiarity, (3) various analyses including form, phrase, harmonic (at an appropriate level), and melodic configuration, and (4) a final compilation of the material, with emphasis on developing an interpretation of the work. This final phase is applied in the actual rehearsal with the ensemble. The synthesis of these elements may or may not include the use of recordings of the work. The danger of accepting the interpretation of another does exist, but the

benefits of receiving a complete representation of the work may outweigh the potential problem for the student.

Summary of Text Review

After examining these texts, it seems possible to draw five main conclusions based on common elements contained in the majority.

1. The need for score study is emphasized in order to prepare the student for the actual conducting of an ensemble. This is in addition to instruction in the mechanical aspects of conducting.

2. Generally, there is an imbalance in the amount of instruction devoted to score study as opposed to baton technique.

3. A systematic, step-by-step process is recommended (and supplied to varying degrees in many texts).

4. Each method shares a progressively deeper examination of the information contained in the score.

5. The basis for a systematic method of score study may be broken down into four main elements. They are:

   (a) Score Perusal or Orientation, which covers all surface information;

   (b) Score Reading, which is a mental examination of the musical elements of the score at a manageable tempo (this step may be done more than once and may involve the use of a piano and/or a recording);

   (c) Score Analysis, which is an in-depth examination of the various musical components of the work (this may also include the use of a piano and/or recording), and

   (d) Score Interpretation or Synthesis, which is an application of all available information in conducting before an ensemble.

Audiation

In the book, Learning Sequences in Music (G.I.A. Pub., 1988), Edwin Gordon addresses the process of hearing music in the mind without physical sound. He calls this process "audiation", and discusses the many parameters of this topic. Gordon defines audiation as " . . . when one hears and comprehends music silently, that is, when the sound of the music is not physically present" (p. 7).

As mentioned in Chapter 1 of this study, the process of hearing music silently while reading notation is called "notational audiation" (p. 8). A distinction should be drawn between memorizing a piece of music and audiating the work. Audiation indicates giving to the music some level of meaning, which in turn indicates a level of understanding or knowledge. While understanding is difficult to measure or even define, it is necessary for the conductor to be able to apply the process of audiation to musical scores. During this process, meaning is given to the notation and a level of knowledge is gained. Gordon identifies meaning given to music when one audiates the syntax of the music. "When one recalls music through audiation, there is no doubt that he must be giving it syntactical meaning" (pp. 9-10). He uses the analogy of a person recalling the way home without actually memorizing directions. A parallel in music is that a musician recalls a piece of music through audiation and

does not need to memorize the actual notation in order to perform it.

Gordon discusses seven evident types of audiation. They are not hierarchical, though they are interrelated. Those applicable to this study are:

1. Type 2 - Notational Audiation: this occurs when one is reading the notation of familiar and unfamiliar patterns in familiar and unfamiliar music. One should be able to organize and audiate familiar and unfamiliar patterns from the series of symbols without the aid of aural perception.

2. Type 4 - Recalling: this takes place when one recalls familiar tonal and rhythmic patterns without the aid of notation. Each familiar pattern guides the organizing and recalling in sequence the subsequent patterns. This process continues throughout a familiar piece of music.

The application of these types is in the area of pattern recognition. Gordon addresses this topic in the matter of memorization.

> We do not recall a familiar piece of music as a result of memorizing it. We recall a familiar piece of music by organizing and sequentially audiating familiar tonal patterns and rhythm patterns of essential pitches and durations and by unconsciously placing unessential pitches and durations of the tonal and rhythm patterns in the complete patterns as they are being recalled in audiation. (p. 12)

Gordon also theorizes six stages of audiation that occur within each type. These are hierarchical and can occur concurrently. The six stages are as follows:

1. Stage 1: The unconscious audiation of short series of pitches and durations heard a moment earlier.

2. Stage 2: The conscious imitation and organization all of the pitches and durations in the series.

3. Stage 3: The conscious establishment of the tonality and meter of the music.

4 Stage 4: The conscious retention in audiation of tonal and rhythm patterns of essential pitches and durations already organized.

5 Stage 5: The conscious recollection of patterns of essential pitches and durations that have been organized and audiated in other pieces of music

6. Stage 6: The conscious prediction of the next patterns of essential pitches and durations that will be audiated in the music

All seven types of audiation along with the six stages contained within audiation have some degree of bearing on the success of a conducting student in an attempt to audiate a musical score. The past experiences, level of talent, level of intelligence, and many other factors individual to the particular student will affect this process. However, the concept of audiation seems to have a direct effect on the gaining of knowledge about a particular musical work. Score study is defined as a "process through which music notation and other information provided in the score are systematically examined and thoroughly assimilated" (Battisti and Garofalo, p. 3).

The process of an examination of the information contained in a musical score may be taught to the undergraduate conducting student. The assimilation of the information is dependant on many factors related to the individual student and is a complex process, as outlined by Gordon. The present study is an attempt to measure how effectively the process relates to the level of assimilation.

Conducting Curriculum

A 1985 survey by the College Band Directors National Association Research Committee on Undergraduate Conducting taken of its membership provided data regarding the content and practice of instrumental wind band conducting courses in the United States. Those items of interest to this study and their relevance is discussed at this time.

After the learning of fundamental conducting skills, the second most important goal of the course is the development of score study skills. Perhaps supplemental instruction is needed in this area, since the development of the basic conducting technique is of first importance.

It is of importance to this study to note the low percentage of responding instructors who incorporate the use of the computer into their curriculum (12%). Those who do require the use of the computer by their students do so primarily in the areas of error detection, pitch discrimination, transposition, rhythm discrimination, and sight singing drill. The committee concluded that while respondents recognize the value of technology in the teaching of conducting, it is usually done in the form of video equipment used for the visual analysis of the student's conducting performance, rather than the computer. This may be due to the lack of appropriate software for instruction in other areas.

One question addressed the breakdown into minutes spent per week in the various activities of the conducting class, score study is not listed as one of those activities, although it is placed highly in the list of the goals of instruction. Identified by this study as one component of score study, score reading and analysis are listed second and sixth, respectively. These may have been regarded by the respondents as separate aspects of score study.

The survey revealed that the conducting texts most frequently used by the instructors were those by Green, Hunsberger, and Rudolf, respectively. It is also important to note that 94% of the respondents indicated the use of supplementary materials in their classes. This would seem to attest that the majority of the instructors felt that the chosen text was not completely adequate to the needs of their students.

When questioned in regard to desired improvements in the conducting program at their schools, many respondents wished for high-technology solutions involving computers, videotape and videodisk players. The use of the videodisk in conjunction with a computer is a tool worthy of consideration in the future, but will not be included in this particular study.

The First Suite in E-Flat for Military Band by Gustav Holst was listed as the most frequently used band score as a model work for study in undergraduate instrumental wind band conducting classes.

Finally, the respondents indicated a number of changes they would like to make in the conducting curriculum at their institution. The fourth priority listed was to "require better prerequisites in musicianship courses and score reading". This would seem to indicate a need for supplemental instruction of some type in the area of score reading in the undergraduate conducting course.

Research studies on methods of score study are relatively few, and those addressing the application of the computer as an aid to such a complex task are few as well. The next section will deal with the existing studies in these areas.

Research Studies

In this section, two areas of research will be reviewed. These are 1) studies involving methods of score study, and 2) studies involving the use of the computer in complex instructional tasks.

Methods of Score Study

Strouse (1987) developed an approach to score study through reviewing selected approaches and general analysis techniques. The aim of the investigation was to develop the most efficient method of learning an extended musical work. He identified three levels of deductive analysis that comprise a Comprehensive Approach to Score Preparation (CASP). Level I, Basal Structure Analysis, explores the

score in terms of the elements that may be translated directly into gesture with no further study. Level II, Review of Supplementary Information, examines the historical and stylistic background of the work and the composer. Level III, Detailed Structural Analysis, involves the individual components of the musical structure in a detailed examination. This method was based on a review of literature and methods and not on an experimental study. It may support the theme of progressive levels of examination needed in a process of score study.

The effectiveness of four systematic score study methodologies were investigated by Hochkeppel (1993). The author employed keyboard study, score singing, recorded study, and silent study as instructional treatments. The students were 47 music majors divided into four treatment groups. After being given a pretest in error detection skills, all groups studied general topics of score reading. Each group then experienced three instructional sessions using one systematic score study methodology. In the posttest, again measuring error detection skill, students utilized the systematic score study technique taught during treatment. The groups utilizing silent study and score singing showed significant gains from pretest to posttest, while the keyboard study and recorded study groups showed no significant gains. It was concluded that systematic score study is an effective pedagogical technique for training instrumental conductors, and that two methodologies, silent

study and score singing, were relatively more effective in improving error detection skill than keyboard or recorded study.

In a similar study, Hopkins (1991) used four approaches: (1) using a piano, (2) using a recording, (3) sight singing, and (4) silent inspection, with four groups of students. Four compositions were studied on four days, with taped performances containing deliberate pitch and rhythm errors serving as stimuli. The students followed the scores, circled the errors they detected, and attempted to notate the errors. The results indicated a higher level of rhythm error detection than pitch, and that the students were better able to detect errors than to notate them. The use of a recording was found to be significantly more effective than using a piano, but no significant differences were found in other approaches. Also, all but one student perceived the presence of nonexistent errors.

Crowe (1994) investigated the effect of four score study styles: (1) no score study, (2) study with score alone, (3) study with score and a correct aural example, and (4) score study at the electronic keyboard, on the pitch and rhythm error detection abilities of beginning conducting students. Students involved in the study were 30 students enrolled in undergraduate conducting classes at three midwestern universities. A Hypercard program was developed to present 31 four- to six-measure excerpts from band literature. The excerpts were played through MIDI (Musical Instrument Digital

Interface) keyboards using sampled wind instrument sounds. Each excerpt contained only one error, and were grouped according to difficulty. Study with the score and a correct aural example was found to be significantly more effective than either study with the score alone or no study. No significant difference was found between score study at the keyboard and any other score study style.

In a landmark study, Hamilton (1984) attempted to discover and create a consensus of an essential curriculum for teaching score study in the undergraduate instrumental conducting class. A survey was sent to the membership of the College Band Directors National Association requesting information as to what methods, materials, and evaluations should be used to teach score study to undergraduate instrumental conducting students. The survey collected data addressing the methods, materials, and evaluations used in teaching score preparation in the undergraduate instrumental conducting class and the opinions of conductors and teachers of conducting about those methods, materials, and evaluations. The results of the study indicated a curriculum which includes 80 separate items in seven major categories to be used in the undergraduate conducting class to teach score study. Included in the results is a recommended list of 170 references used by the participants in the study to teach score study.

The existance of few actual studies in the methodology of score study, or score study in general, indicate a need

for further study in this area. The majority of such studies focus mainly on error detection skills, which is a necessary ability for the conductor. However, without a preconceived mental image of how the work should sound, it is difficult for the student to make decisions on all but the most obvious errors. It is likely that the subjective nature of this area of research is responsible for its neglect, as well as the difficulty in accurately measuring the knowledge gained. Knowledge gained during score study is best utilized in the communication of the piece to the ensemble by the conductor. It is difficult to devise an accurate measurement tool for this activity, and even more difficult to carry out an experimental study while controlling the many variables involved. In addition, it is evident that instructors of conducting do not agree in regard to the best method of teaching score study.

Computer-assisted Music Instruction

Brief History

Early efforts in computer-assisted music instruction and research into the effectiveness of this tool began in the late 1960 s. Kuhn and Allvin (1967) reported an experimental CAMI station at Stanford University. A pitch extraction device controlled by an IBM 1620 computer was used to judge the pitch accuracy of melodic patterns sung into a microphone. Since students reported increased pitch awareness, the authors suggested future investigation

During 1967-69 Deihl (1971) reported a study at Pennsylvania State University to develop CAMI in ear training for instrumental musicians. An IBM 1500 computer was used to train students to recognize discrepancies in phrasing, articulation and rhythm by comparing aural and visual versions of musical examples. Comparison of pretest and posttest scores indicated significant gains both in aural discrimination and in performance.

In the early 1970's, CAMI began to be tested in the classroom in order to determine whether it was more or less effective than traditional classroom music instruction. This was first done using the PLATO computer-assisted instruction system at the University of Illinois during 1972-73. Also, Von Feldt (1971) compared a CAMI program with the standard classroom method for teaching the fundamentals of notation to seventh grade music students. He concluded that the CAMI taught equally well in 30 percent less time. Thompson (1973) developed a CAMI program for teaching music students to sing pitch patterns at sight. Students using the program demonstrated significant improvement as compared to a control group. The reaction of the students was quite positive. All of these experimental studies helped to show the feasibility of computer-assisted instruction in music. Actual classroom delivery of instruction began about 1973.

Regular instruction on the PLATO system began at the University of Illinois in 1973. This included programs for the teaching of rhythm, an aural discrimination program and

later a sequence in music theory. At the University of Delaware, the GUIDO system, a set of ear training drill and practice programs was developed by Hofstetter (1975). This included graded sets of exercises in interval recognition, melodies, chord qualities, harmonies, and rhythms. The AMUS system at North Texas State University was designed to incorporate drill and practice of ear training as part of the basic curriculum.

Many studies have been performed on the use of the computer in music instruction. These have been done largely in the area of practice situations on the fundamentals of music as a supplement to regular classroom instruction. These include the areas of note reading skills, ear training, history, theory, and composition. Computer-assisted music instruction (CAMI) has been shown to be almost as effective as teacher instruction and "perhaps more effective in drill and practice situations" as reported by Taylor (1981). Therefore, it does not seem beneficial or practical to review the many studies on the effectiveness of CAMI. Instead, the focus is on the relatively few studies that utilize the computer in more complex tasks. For the purposes of this study, it is these types of experiments that are relevant and are examined.

Recent Studies

Schwaegler (1984) developed a computer-based music conducting trainer and investigated its effects in four modes of information feedback on undergraduate conducting students.

The music conducting trainer measured the steadiness and shape of the student's conducting patterns and provided continuous feedback either concurrent with performance or following performance. The results indicated that the students who received training with supplementary information feedback performed with a more ideal pattern than the students who received training without such information feedback. In this study, the computer was used to analyze the shape of the conducting pattern and compare it to an ideal based on one found in the conducting text. Although actually a "drill-and-practice" situation, the computer was able to perform a task that was outside the normal parameters of a question and answer format.

An interactive multimedia computer program for teaching interpretive aspects of wind instrument notation was designed and field tested by Adams (1989). The program was developed for instruction in tempo, dynamics, articulation, indications of form, and simple ornamentation. Students listened to computer-controlled professionally recorded examples on their individual instruments and were instructed to imitate what they heard. A pretest-posttest design measured student performance of musical examples, which were evaluated by a panel of experts. The results indicated a significant increase in the mean scores between the group receiving the treatment and those who did not. The author concluded that a computer-based interactive multimedia approach was a viable

method of teaching interpretive aspects of wind instrument performance.

Strange (1990) developed a beginning violin curriculum integrating a computer music station with the principles of comprehensive musicianship. The author attempted to develop a comprehensive curriculum for the violin using a computer music station and music education software as resources. The first phase of the study consisted of developing broad objectives for six units of instruction and the completion of one unit for evaluation and refinement. This unit included six songs with electronically produced accompaniments, coordinated theory lessons, suggested software programs, and other related activities. The second phase was an evaluation of the first phase by three professionals and a four week study with five students. Evaluations by the instructor, students and parents followed the second phase. The third phase was a subsequent revision of the first unit and completion of five more units. The completed curriculum included thirty-six songs with electronic accompaniments, coordinated theory lessons, and suggested software programs. The overall intent was to merge the new techniques of electronic technology with the principals of comprehensive musicianship and apply the effects to aid beginning violin pedagogy.

In a similar study, Ko (1990) developed a system as a supplement to traditional violin instruction. The Violin Monitoring System (VMI) measured and compared bow pressure,

velocity, position, and sounding point, utilizing strain gauges and wires attached to both the violin and bow. After the information is collected and displayed, it is then stored on a personal computer. This allows for the comparison of factors with the readings of other players, both novice and expert. The results of prototype testing indicated suitability for further research and development.

Jones (1991) developed and tested a system which would enable music education students to effectively practice error detection skills in the context of score reading. The program included computer-assisted instruction, random access audio, and printed music score examples. It was intended to supplement the regular instruction portion of undergraduate conducting classes. The students identified the error inserted into the audio example by type, measure location, and instrument performing the error. Results indicated a decrease in response time and an increase in correct responses. This, showing the effectiveness of the Error Detection Practice System as a tool for use in conducting classes. While this is a rare example of the use of the computer in conducting and score reading, it's original purpose was that of error detection, not in forming an interpretation or knowledge of a specific work.

In a similar study, Gruner (1993) investigated the effects of a computer-assisted instruction program for the purpose of developing error detection skills in beginning conductors. Utilizing synthetic sound sources, the program

tested the ability of 24 students enrolled in a beginning conducting class to identify rhythm and pitch errors within 2-, 3-, 4-, and 5-voice synthesized musical excerpts from existing band literature. The transfer of error detection skills from synthesized to acoustic sounds was also explored indirectly, using taped excerpts from wind band performances to assess error detection skills. A pretest-posttest design utilizing the Acoustic Error Detection Skills Inventory as the dependent measure was administered, with the experimental group using the CAI program for a total of eight hours over an eight-week treatment period. Results indicated a significant improvement in the pretest-posttest gain scores for the experimental group and a non-significant improvement for the control.

Dalby (1989) determined the effectiveness of a computer-based training program for improving student's ability to make judgments of harmonic intonation. The Harmonic Intonation Training Program was developed for the PLATO Interactive Music System at the University of Illinois. This program consisted of a body of drill and practice exercises utilizing intervals, triads, and brief three or four part musical passages. Although written in a drill and practice format, the computer was used to handle a variety of complex functions in three types of exercises and two different tunings.

Hughes (1991) tested the ability of interactive computer technology in the acquisition of recognition ability for a

core repertoire of music literature. Students utilized a computerized hypermedia listening station employing researcher-designed instructional programming. The intent was to determine if such use would augment their ability to identify selected works in a subsequent recognition task. The control group utilized a typical repeated hearing strategy. While the pretest showed no significant difference between the groups, the test following the treatment indicated a significantly higher score by the experimental group. These results indicated that the use of a hypermedia listening station can improve the recognition ability of students while possibly decreasing the amount of time needed for the process.

Chen (1992) used Hypercard as a platform to develop a computer-based notation instruction program for Chinese students. The purpose was to investigate the feasibility of using a computer to teach music notation to Chinese students. The author utilized the Hypercard platform to develop an interactive hypermedia program. This program featured the use of digital sounds and animation, inter-linked multiple representations, a graphic user interface, and a self-directed learning environment.

Rodriguez (1992) created eight programs in a variety of formats including gaming, tutorials, and creative reading activities in order to illustrate Hypercard's adaptability in programming educational programs by music educators. These programs were designed for elementary students in the

learning of keyboard skills. The aim of the study was to demonstrate the ease of a programming language for the music educator who is not a computer programmer, which would serve the needs of keyboard educators who want a variety of software applications. Although informal preliminary testing by the author was successful, further testing was recommended.

Sigurjonsson (1991) constructed a Hypercard stack which interacted with a compact disk recording of a serial composition. A description of a hypothetical occasion structured to elicit the students' thinking about the composition was presented. Each participant was asked to rate the music on preference, performance, complexity, and understanding. They were also asked to write a response to the music and the hypothetical scenario and again to rate the music on the same four variables. In addition, they were asked to comment on the exercise, the scenario, and to provide suggestions for educational implications. The purpose was to determine the extent to which the educational status of the listener would be reflected in the content of their written discourse. Participants responded favorably to the exercise and thought it easy to use and self-explanatory. They also found it to be thought provoking and suggested that an exercise of this kind would be of value in music education.

Colman (1990) created a computerized diagnostic test capable of measuring the music theory achievement of incoming

freshman students. The test was intended to accurately assess a level of knowledge for entrance into theory courses. The study also sought to determine whether this test could function as a predictive variable in the evaluation of future success in music theory. Utilizing Hypercard, the computer handled all aspects of the test. This included data storage, administration, test result printouts, and statistical analysis. The study concluded that the test was sufficiently successful to warrant further development for future use as a diagnostic and predictive tool.

Venn (1990) developed a computer-based, random-access audio test of four musical elements: melody, rhythm, texture, and tonality. The program used Hypercard to synthesize music, to store and play digitized music, and to access music from audio compact disks. The test measured an examinee's skill in three areas, (1) indicating if a change in the element had occurred, (2) indicating the existence of a compositional device related to the element, and (3) indicating the place in a musical selection where a change in the element occurred. A format allowing examinees to compose a melody for a poem was devised. The test gave the examinee control of the playing of musical examples while on-line help provided assistance in the navigational aspects of the test. The test was then computer scored. The author concluded that current computer technology can improve the evaluation of musical achievement.

Richmond (1994) developed a Hypercard-based authoring system entitled "Lesson Writer". This system enabled music teachers with limited experience in technological applications to devise their own computer-assisted music instruction lessons. The author included extensive guidelines and instructions on the development of such applications as well as explanations of the various elements contained in the Hypercard tool. An annotated bibliography of dissertations written between 1992 and 1993 on the topics of computers and music and techniques for adding multimedia aspects to lessons are also included. This document may be a valuable reference for educators who wish to develop their own applications in computer-assisted music instruction.

Serrano (1993) developed a computer program to simulate conducting motions on a screen. The investigation involved 49 musicians and 40 non-musicians responses to a point of light moving around a computer screen simulating the tip of a conductor's baton. Students were asked to press a button each time they perceived a beat portrayed in the motions. The timing of student responses to four modes of motion was recorded and analyzed. It was hypothesized that the speed and direction of conducting motions from one given beat to the next play an important role in the ability of the observer to anticipate and synchronize their motor activity. This experimental design allowed the examination of visual perceptions of simulated conducting motions showing distinct motion behaviors exclusive of sound and other sensory cues.

Results of the investigation indicated that both musicians and non-musicians respond with a high degree of uniformity to a type of conducting motion which resembles the motion produced by gravitational forces--accelerating going down, decelerating going up, and following a parabolic trajectory when moving to either side. A motion which is inversely proportional to the motion produced by gravity yielded mixed results. Non-musicians responded more uniformly than did musicians, who were divided according to two distinct interpretations of where the beats occurred.

These studies seem to indicate that the current state of technology is of a sufficient level to allow the computer to handle more complex tasks in music instruction than that demonstrated in earlier studies. However, the available software for music education is not yet tailored to the needs of students in this regard, nor does it take full advantage of the usefulness of advanced technology. The use of Hypercard as a user-friendly programming platform is becoming more prevalent as music educators design their own applications tailored to the needs of their students. (Lalonde, 1991; Coffey, 1994) The ease of use and multi-tasking capabilities of Hypercard allow the design and execution of various applications with relative ease, given the time and proper equipment. The next generation of computer hardware will offer even more alternatives to supplement the instruction experienced in the classroom.

There is a need for more experimentation and research in this area as it relates to music education. Investigations utilizing the computer in multimedia-type applications are being done in other disciplines. The next section examines those concerned with educational applications.

Research Studies in Educational Multimedia

Introduction

A diverse body of research will be examined under the following topics and in this order: Design and Development, Use and Effectiveness, and Implications. The usefulness of multimedia applications in enhancing learning coupled with the possibility of their development by educators are addressed, as well as their effectiveness and implication for the future. This review is intended to indicate the possible use of multimedia applications in instructional tasks related to music. In addition, studies involving students in primary and secondary educational levels are also examined in order to provide a more thorough investigation into uses of interactive multimedia applications in education. The primary concentration is on those studies which compare some type of computer-assisted multimedia instructional approach to a more traditional mode of instruction. The perceptions and attitudes of users toward this type of technology are also addressed when applicable.

Design and Development

Perkins (1993) used interactive multimedia as a tool for the interpretation of a historic site. The techniques developed allowed the individual elements to be available in a single publication. The program presented an icon-based interface which allowed the exploration of images, text, movies and sound. This illustrates the necessary component of interactivity, which is the capacity to reference and link to supplemental information about a subject.

Wright (1993) designed a study to demonstrate that non-technical personnel such as educators and administrators could develop affordable and effective multimedia applications. An additional purpose was to demonstrate that technology was sufficiently advanced to allow such development without excessive time demands becoming a prohibitive factor. The students found that the technical approach was innovative and could be useful. District administrators expressed interest in using the program.

Chuckran (1992) measured the feasibility as well as the effectiveness of student-produced interactive multimedia. Seventy high school students used Hypercard linked to a videodisk player to develop a project examining a biosphere of the world. Students with little computer experience and no Hypercard experience produced interactive multimedia and exhibited a positive response to the assignment. More than

two-thirds of the students suggested the project be used in the course again next year

Vogeli (1991) investigated the Hypercard programming tool from the perspectives of the educator, student, and software developer in order to provide a complete evaluation of Hypercard and its utility in education. Two courses in Hypercard programming, one to in-service teachers and the other to high school students, were taught with the work collected and evaluated. Based on these evaluations, Vogeli concluded that Hypercard could be mastered by teachers and students with little or no programming experience. The author also produced two educationally relevant programming projects selected to challenge the programming capabilities of Hypercard. One was an administrative scheduling program for a high school, the other a library control and query package. These investigations indicated that Hypercard is well-suited for the development of complex programs for use in educational applications. The author also praised this tool for its potential in enriching education and utilizing the capabilities of modern computer hardware.

A similar investigation was performed by Freitag in 1991. Fourteen groups of eighth grade science students utilized the Hypercard programming tool with videodisk technology to develop interactive multimedia projects. Each group worked independently for ten instructional periods over a five week time frame. The results indicated that this use of interactive multimedia by students extends their possible

learning experiences, motivates students to stay on task, and can be effectively used for meaningful learning.

Use and Effectiveness

Borres (1993) developed a multimedia program enabling individual practice of two video-based oral tasks. Forty-two fifth semester college students in French studies tested the program. The program integrated Hypercard and videodisk technologies and measures the effectiveness of subtitled video during practice in oral communicative performance. The results indicated a significantly higher performance on the assessment tool and significantly better attitudes for the students receiving the treatment than those who did not.

In a similar study, Hughes (1993) investigated the effectiveness of a computer-controlled videodisk system in the acquisition of Spanish vocabulary. A pretest assessed vocabulary knowledge in four experimental groups. Three of the groups then received a form of treatment, one of which was the computer-controlled videodisk system. All treatment groups showed higher increases on posttest scores, with the multimedia groups displaying the highest level of increase in vocabulary scores. The author concluded that this technology can assist in the teaching of Spanish vocabulary.

Nishino (1993) utilized a multimedia computer-based science learning environment to investigate the effects of the treatment on the areas of self-concept, gender, and science learning. The population were 160 eighth grade

students from two schools in the same district. The control group received instruction based on traditional teaching methodologies in science, while the experimental group utilized the multimedia computer-based science learning environment. The results indicated significantly higher posttest scores by the students in the experimental classroom in both the areas of self-concept and on the Science Test than those in the traditional classroom.

Stins (1993) investigated the use of CD-ROM interactive computer-based books versus a traditional whole language reading instructional approach. The author examined the effects of two instructional methods on reading achievement and attitudes toward reading of second grade students. The study showed significantly greater gains in vocabulary and reading comprehension for the treatment group than the control group. The results also suggested that an interactive environment allows students to become actively involved in their own learning. A more positive attitude is fostered toward academic and recreational reading.

Occhuizzo (1993) compared two groups of twelfth grade students enrolled in an advanced general physics class. The class was randomly assigned to a control or experimental group. The control group performed laboratory experiments in the traditional manner, while the experimental group utilized computer-assisted instruction in the form of the Hypercard platform linked to an analog-to-digital interface. All of the students were pretested using an achievement test and

than were given the appropriate treatments. The posttest results indicated that the students taught with the computer multitasking format achieved as well or better than the students taught in the traditional manner. In addition, the multitasking group indicated a higher level of competency in laboratory reports and graphical accuracy, as well as a higher level of understanding when interviewed by the teachers involved.

In a study of first-year graduate students in social work, Patterson (1991) compared diagnostic accuracy measured before and after self-instruction. The experimental group utilized a Hypercard interactive educational program designed to train mental health professionals in making accurate diagnoses in personality disorders. The control group used only the training manual during their self-instruction. The results indicated that the computer interactive educational program was as effective an instructional medium as the traditional method using the training manual. In addition, students using the interactive educational program expressed a significantly more positive attitude toward their mode of instruction than those using the training manuals.

Chin (1993) surveyed a group of elementary teachers in the Midwest in order to discover their perceptions of instructional technology use and the need for such tools. The need for inservice training in this area was also investigated. The results indicated an expressed need for inservice training in the areas of interactive video and CD-

ROM applications, along with training in computer software application and evaluation, word processing, and database skills. The findings also indicated that the newer technology such as interactive video and CD-ROM applications are practically non-existent in elementary schools.

Newbold (1993) conducted a study measuring sixth grade students attitudes toward writing, using the library, computers, and electronic encyclopedias. The results of this experiment indicated a more positive attitude toward writing and using the library. The students also preferred using the more modern technology as opposed to traditional methods using standard print.

Implications

Kalk (1992) surveyed 105 representatives from Fortune 500 communication related corporations, teacher education programs in technology, and the International Technology Education Association. The panel was asked to indicate whether or not the current content for communication in elementary Technology Education would be appropriate at the beginning of the 21st century. They were also asked to recommend additional items to be included in future rounds of the study. The panel responded with 92 items that were appropriate for inclusion, while slightly over 25% of these items were identified as potentially inappropriate by the beginning of the next century. The 32 items in the upper 25% included computer-assisted drafting (CAD), multimedia

applications, desktop publishing, and other items with a strong emphasis on electronic related communication technologies.

In a similar study, Wilson (1993) attempted to determine the future direction that learning resource centers will take at the community and junior college levels. A panel was selected based on educational, vocational, and professional backgrounds. Following the panel's report, a mass mailing to all community colleges in the country was used to verify the findings. Inter-library loans, facsimile transmissions, on-line catalogs, CD-ROM use, electronic classrooms, telecourse checkouts, and camcorder use were identified as areas that would see increased use in the future. Predicted to grow in the areas of education and computer resources were CD-ROM applications, student computer use, word processing, computer graphics, networking, telecourse downlinking and checkouts, video recording, and teleconferencing.

McLaughlin (1992) attempted to determine expert judgments regarding possible technological combinations of systems and optical data storage. The emphasis was on those systems that may occur in the following five years (1991-1996) if applied in the educational and training fields. The participants in the study were instructional technology professionals, trainers, system researchers and developers, and optical data system storage system experts. The panel predicted that it will be possible to combine expert systems with an optical data storage technology such as CD-ROM or

interactive video in computer-assisted instruction within the specified time period. It was also noted that the effective application of these technologies may be hindered by production costs, technical difficulties in creating and updating such systems, and the lack of studies which demonstrate the value of these instructional systems.

Preceding this study, Tuthill (1990) gathered predictions from experts concerning the future applications and impacts of optical-based media by the year 2001. As a result of the study, the panel suggested that education will be enhanced by computer-controlled branching and delivery of visual stimuli. In addition, the educators on the panel strongly suggested that the success of optical media in education will be dependent upon sound instructional design

Summary

Multimedia computing is now considered to be the next evolution in the area of computing (Ottinger, 1993). Most computers are now being marketed with multimedia capabilities already installed. Multimedia applications can bring a vast amount of information to the user in the most intuitive and best suited manner (Coffey, 1993). This technology is now of the appropriate level and degree of accessibility, using the Hypercard tool as the driver, for educators and students to develop educational application specifically tailored to the needs of the user. Technology has advanced to a level that will allow the use of the computer in ways other than the

standard drill and practice routines of the past. However, there is a need for further research in this area in order to determine the most appropriate areas for this type of instruction. It is safe to conclude that the use of this technology is a viable supplement to standard instructional methods.

Research studies involving computer-assisted music instruction have proliferated in recent years, with somewhat less research in the area of score study. However, studies combining these two topics have not yet been done, except for a few in the area of error detection. Score study is an area of little standardization, with few research studies being done on the need for and the most effective means of score study. Many texts and other writings on this subject have been done, which usually focus on the technical aspects of conducting. Most texts generally contain some reference to a process of score study. In recent years, however, research in computer-assisted instruction in music has been extensive, and the research suggests that traditional music instruction in fundamental knowledge and skills can be improved through CAMI. However, computer-assisted music instruction in more complex tasks has not yet been explored extensively through research, particularly in the area of score study. There appears to be a complete lack of experimental studies using the computer as an aid to score study for the purpose of supplementing traditional classroom instruction in instrumental wind band conducting.

CHAPTER 3
PROCEDURES

Introduction

The purpose of this study is to (a) develop a computer-assisted music instruction program as an aid to score study, using a specific work from the wind band repertoire as a model and (b) test its effectiveness in improving knowledge of the work as measured by a researcher-developed test.

Two basic questions are addressed: (1) Can the computer be used to effectively supplement regular classroom instruction in the area of score study for instrumental wind band conductors? (2) Can knowledge of a musical work be improved for the undergraduate instrumental wind band conducting student through the use of a computer-assisted music instruction program designed for that purpose?

Hypotheses

The primary research hypothesis for this study is that students who use a computer-assisted music instruction program to supplement traditional classroom instruction in the area of score study will improve their knowledge of a specific wind band score more than students who do not use a computer-assisted music instruction program. The

corresponding null hypothesis is that there will be no statistically significant difference in the posttest scores on the model work between students using the computer-assisted music instruction program as an aid to score study and students not using the program.

Due to the progressive levels of study present in the computer-assisted music instruction program as well as the progressive levels of knowledge required for successful completion of the test, it is necessary to investigate three additional hypotheses as well as the primary hypothesis. These are patterned after the process recommended in the Guide to Score Study for the Wind Band Conductor. The progression of study recommended to the student in the computer-assisted music instruction program as well as the pre and post tests are patterned after this model.

The first of the additional hypotheses is that students who use the computer-assisted music instruction program designed to supplement traditional classroom instruction in the area of score study will demonstrate a greater recall of the basic surface details of the score than students who do not use the computer-assisted music instruction program. The corresponding null hypothesis is that there will be no statistically significant difference in the posttest scores on Section One (Score Orientation) of the test, which requires basic knowledge of surface information contained in the score, between student using the computer-assisted music

instruction program as an aid to score study and students who do not use the program

The second additional hypothesis is that students who use the computer-assisted music instruction program designed to supplement traditional classroom instruction in the area of score study will be able to identify visual excerpts from the score and recall specific information regarding each excerpt with a greater degree of accuracy than students who do not use the computer-assisted music instruction program. The corresponding null hypothesis is that there will be no statistically significant difference in the posttest means on Section Two (Score Reading) of the test, which requires visual familiarity with the score, between student using the computer-assisand music instruction program as an aid to score study and students who do not use the program

The third and final of the additional hypotheses is that students who use the computer-assisted music instruction program designed to supplement traditional classroom instruction in the area of score study will be able to identify aural excerpts from the work and recall specific information regarding each excerpt with a greater degree of accuracy than students who do not use the computer-assisted music instruction program. The corresponding null hypothesis is that there will be no statistically significant difference in the posttest scores on Section Three (Score Analysis) of the test, which requires aural familiarity with the score, between students using the computer-assisted music

instruction program as an aid to score study and students who do not use the program.

The procedures that are used in the present study are presented in this chapter. They are discussed under the following headings: (a) selection of the sample, (b) research design, (c) treatment variable, (d) dependent measures, (e) methodology, and (f) statistical analysis. The application of these headings is discussed in the "methodology" section and in a following section addressing the plan for a pilot study of the computer-assisted music instruction program.

Selection of the Sample

This investigation utilizes a sample of undergraduate instrumental music education students enrolled in instrumental wind band conducting courses at various universities. Institutions were selected from the College Band Directors National Association directory. Names were identified as instructors who are considered knowledgeable in the field of conducting and instruction, and these instructors were contacted and asked to participate in the study. The criteria for participation are (1) the institution must offer an undergraduate level course in instrumental wind band conducting, (2) the course must contain some instruction in a method or methods of score study, (3) the institution must own and make available to the

students the required computer equipment for this study, and (4) the instructor must agree to participate in the study

Upon completion of the contact process, four schools agreed to participate in the study and the total number of students involved in the study was of sufficient quantity (n>30) to be regarded as a representative sample. The undergraduate instrumental wind band conducting class at each institution was randomly assigned, half to an experimental group and half to a control group. Both groups are pretested using the researcher-developed test on the model work. The experimental and control groups continued with their regular conducting class instruction. In addition, the experimental group used the computer-assisted music instruction program designed for the Apple Macintosh computer.

Research Design

The experimental design used in the study is the "randomized subjects, pretest-posttest control-groups design" (Ary, Jacobs, and Razavieh, 1985, p. 274). The control group is a "no-contact" control group. This design allows for statistical equivalence between the groups prior to experimentation and, through the initial randomization, controls the majority of the possible sources of internal invalidity. The danger of this design is the use of the pretest, which may sensitize both the experimental and the control groups to the treatment or lack thereof, and cause the groups to respond to the treatment and/or the subsequent

posttest in a particular way. However, according to Ary, Jacobs, and Razavieh, this design is "widely used [illegible] in spite of this shortcoming [illegible] because the interaction effect is not a serious problem in most educational research" (p. 275). The design is illustrated as follows:

Group	Pretest	Treatment Variable	Posttest
(R) E	Y1	X	Y2
(R) C	Y1	___	Y2

Treatment Variable

The treatment variable used in the study is a computer-assisted music instruction program developed using the Hypercard programming package. The computer to be used is an Apple Macintosh model, available at many educational institutions. In order to fully utilize the program, the computer must have a built-in or peripheral CD-ROM drive. The computer is able to access an audio compact disk of the model work. A large screen monitor is preferred, but not necessary. A keyboard or piano is optional and may be useful to the student, and a full score is recommended. The Apple Macintosh is selected for the following reasons: (a) the Macintosh is a "user-friendly" computer, which allows those with little or no computer experience to become familiar with its use in a brief period of time, (b) the Hypercard package (found only on the Macintosh) allows the design and

implementation of the program with relative ease for the program designer and the students; (c) the graphic nature of a music program is better facilitated on the Macintosh, which is more graphics-based; (d) some models of the Macintosh have built-in CD-ROM drives or an external drive, a necessity for this program, and (e) due to the proliferation of educational and music software developed for the Macintosh, many institutions have this computer in their music labs and make them available for student use.

The Hypercard toolkit, with its Hypertalk programming language, is chosen for ease of application and handling. Developed by Bill Atkinson, it is "[illegible] a software engine - a hypermedia toolkit. With Hypercard, virtually anyone can become a software author, producing an information-based application that looks like a professionally designed Macintosh application" (Goodman, 1988, p xviii) This platform allows the student to develop his or her own ideas for a program application and realize these ideas in graphic form on "cards" with text, pictures, sound, borders, and various effects such as linking from one card to another. The use of buttons allows the student to move from one card or stack of cards to another. This permits branching and freedom of movement throughout the program Hypercard also supports applications such as MacPaint, MacDraw, or Superpaint for the free design and/or importing of graphics from scanner and/or graphics files. Hypertalk, the programming language, is a simple, text-based set of

instructions and commands. Many are built in from which the student may choose. The computer-assisted music instruction program on the Holst First Suite in E-Flat is developed on this platform with the goal of bringing together in one location the information needed for a study of the work. Instructions for the use of the computer-assisted music instruction program and instruction in a process of score study are included as well. A brief description of the program follows.

The computer-assisted music instruction program begins with an introductory screen presenting the title and composer of the model work, along with the opus number, titles of movements, and dates of the composer. An arrow pointing to the right indicates forward movement in the stack. This leads to the index screen which contains a number of labeled buttons directing the student to various other stacks. These include Instructions, Biography, Score, Compositions, References, Play, and Analysis. Each stack is discussed in some detail below, and samples of each stack and its cards may be found in Appendix E.

The stack labeled "Instructions" may be accessed from any other stack as the need arises in the form of "Help" or "Instructions" buttons. The initial cards of the "Instructions" stack deal with general information on the use of the program, including a recommended order of progression and the basic features of each stack. The instruction cards are arranged in the recommended order of sessions the student

is to follow, each card containing a button that allows the student to go directly to the specified ethuk from the corresponding instructions. Subsequent cards may be accessed from other stacks in the form of "help" buttons that give further assistance in the use of the program.

The "Biography" stack contains extensive biographical information on the life of the composer found in Gustav Holst: the Man and His Music (Short, 1990). The material is arranged in chronological order and focuses on significant events in the life of Holst. The student is given the option to click on the name of any listed work for more specific information on that piece. This links the "Biography" stack to the "Compositions" stack and takes the student to the card of that stack that contains the data on the work in question. After reading the supplementary information, the student may then click on a button that returns him or her to the card in the "Biography" stack. The text is accompanied by graphics of the composer at various times in his life.

The ethuk labeled "Score" is one of three stacks that utilizes the CD-ROM drive and the audio CD of the work. The CD chosen for this study is a recording by Frederick Fennell and the Cleveland Symphonic Winds (1978, Telarc CD-80038). This particular recording is chosen due to the extensive research and experience of Fennell with the music of the British school, including that of Holst. With the CD installed in the drive, the student may follow the score as the piece is played. The condensed score (Boosey & Hawkes,

1921) was first entered into the computer using Mark of the Unicorn's Professional Composer, which supports the MacPaint format. Each page was saved in this format and then transferred to Hypercard, where it was edited for legibility and adherance to the original score. The student may go directly to the beginning of each movement, where a button starts the CD at that point in the recording. The student must move through the score manually by clicking the forward arrow at the appropriate time, and may also stop or pause the CD at any time to examine the score more closely. This is required in order to keep the student actively involved in the process of following the score and to avoid simple passive listening. The graphics contained in the "Score" stack also include an analysis of the phrase structure and markings to indicate specific musical events in the overall form of the work. These include the main and secondary themes, variations, bridge passages, and so on.

As discussed above, the "Compositions" stack is linked to the "Biography" stack for further material on other works for the wind band by Holst. However, it may also be utilized separately according to the needs of the student. The list of works and accompanying information is taken from Band Music Notes, (Smith & Stoutamire, 1979).

The "Play" stack contains three cards, one for each of the three movements. Each card contains a CD Controller, which resembles and operates like the controls of a CD player. The student has the freedom to listen to any portion

of any movement or the entire work. However, the strength of this stack is in the list of the various musical events contained in each movement. As the student clicks on a specific event, the CD immediately begins to play the isolated excerpt. For example, the student may wish to hear only Variation Five of the first movement, and may do so by clicking on that listing. This is particularly useful for an in-depth aural analysis of the piece and for increased familiarity with each component of the work.

Finally, the stack labeled "Analysis" contains a description of each event, with the graphic musical notation of the excerpt and accompanying play button displayed. A descriptive analysis of each event contains pertinent information such as the derivation of themes, the combining of themes, and so on. The thematic analysis was taken from the article "Thematic Derivations in the Holst First Suite in E-Flat" (Gallagher, Journal of Band Research, 1987). The student may choose to read the text only or he or she may listen to the accompanying musical example while reading the text by clicking on the appropriate button. This results in the specific musical event being heard from the CD while the illustrative text is read. The student may then proceed to the next card or continue to review the present event. The analysis is one of a descriptive nature and is designed to develop an overview of the work rather than an in-depth harmonic analysis. That is left for the student to develop based on practicality, necessity and instructor discretion.

A harmonic analysis was not considered to be practical for inclusion in this program. Considerations of available disk space are prohibitive, particularly for the 800 kilobyte disks sent to the participating institutions. In addition, the student will gain a greater knowledge of the work by developing the harmonic analysis him or herself rather than relying on a built-in analysis written by another.

A brief set of instructions for the student is included with the computer-assisted music instruction program. These guidelines supply basic information on the use of the Macintosh computer, the method of entry into the program, and an outline for each of the required instructional sessions. A copy of these instructions may be found in Appendix D.

Dependent Measure

There is no standard measurement instrument for testing knowledge of a musical work. The actual application of knowledge gained as a result of score study occurs in the rehearsal, where the conductor demonstrates the ability to mold the ensemble sound to the ideal mental image obtained through study of the score. The mechanical aspects of conducting, i.e. the use of gesture, the basic musicianship of the student, and the experience of working with an ensemble, are factors which cannot be controlled from subject to subject. However, they must also be addressed in the instrumental wind band conducting course. Therefore, an attempt was made to devise an instrument which would give an

adequate measurement of knowledge obtained by the student through the use of the computer-assisted music instruction program in addition to the normal classroom instruction and also through the classroom instructing alone. In addition, the test itself is not included in the computer-assisted music instruction program in order to maintain uniformity in the application of the measurement tool between the control and experimental groups. However, this feature could be integrated into such a program by the instructor wanting to supplement his or her own classroom instruction.

The wind band conductors who consented to integrate this study into their normal classroom instruction were asked to critique and edit a researcher-developed test for content validity. The test is designed to measure the student's degree of knowledge about the work under study (First Suite in E-Flat for Military Band, by Gustav Holst). The test was developed and presented to the instructors for their approval. They were asked to examine the test in order to determine its validity in measuring the necessary level of knowledge of this specific work and make necessary revisions and suggestions, and to bring any necessary revisions to the attention of the researcher. The test and computer-assisted music instruction program were also pilot tested, with subsequent revisions made. The results of the pilot study may be found at the end of this chapter.

The test consists of multiple-choice and short answer questions and is modeled after the process recommended by

Battisti and Garofalo, which is supported by a review of the literature. The first phase, Score Orientation, requests information easily found in an initial perusal of the score. Specifically, the information requested includes the following:

1. title of the work
2. composer's name and dates
3. date of composition
4. number, titles, and definitions of movements
5. key and meter signatures
6. basic tempos of each movement
7. performance time of each movement and the entire work
8. definitions of various musical terms found in the score
9. other works for the wind band by the composer

The second phase, Score Reading, utilizes ten score excerpts in a timed study of 45 seconds each. The student then answers questions regarding basic information found in a mental reading of the excerpt. The specific information requested in this portion includes the following:

1. meter
2. key
3. voice containing the melodic line
4. the predominant texture
5. the predominant dynamic level
6. any changes of key or meter that may be present
7. the predominant style
8. the relative thickness of the scoring

Phase Three, Score Analysis, utilizes ten audio excerpts from the work, and requests information on each example that requires a familiarity with the overall piece. Students are asked to identify the following:

1. movement from which the excerpt is taken
2. the musical event, such as a variation, primary or secondary theme or combination of themes
3. the phrase structure of the excerpt
4. the tempo or metronome marking

5. the predominant instrument(s)
6. whether the excerpt is in a major or a minor mode

The test is in written form, with the accompanying printed score excerpts and a cassette tape of the aural excerpts. A copy of the test may be found in Appendix E.

Methodology

Undergraduate music education students in similar instrumental wind band conducting classes at the universities are pretested with the researcher-developed test on the First Suite in E-Flat. Before the pretest, half of each class is randomly assigned to participate in the study without their knowledge.

The experimental group in each class receives the computer-assisted music instruction program in addition to the regular classroom instruction. The control group receives only the regular classroom instruction. Both groups are assigned the First Suite in E-Flat as a model for score study due to its prominent place in the standard wind band repertoire. (Hemberger, 1988)

Students in the experimental group are each provided instructions for the use of the program and the CD-ROM drive with the accompanying audio CD. The required contact time with the program is for a period of three weeks, with two sessions per week, for a total of six sessions. The students are requested to log their time and to not vary the required number of sessions. This is necessary in order to control

the variable of repeated or prolonged contact with the computer-assisted music instruction program. However, the length of each session is left to the discretion of the individual student. Beyond these guidelines, they are allowed any other means of score study recommended by the instructor in the normal classroom instruction. The computer-assisted music instruction is intended to be only a supplement to the classroom instruction and to enhance knowledge gained in that setting. Students in the control group are also given a period of three weeks to study the work, using any means recommended by the instructor in the regular class instruction.

The recommended course of study for the students utilizing the computer-assisted music instruction program is as follows:

Session One - Introduction

The printed materials that accompany the computer-assisted music instruction program direct the student to open the program on the computer, which immediately brings up an introductory screen. After viewing this screen, the student moves forward to the next card containing the index. This is the hub of the program and allows the student to choose and move between stacks. When the student is asked to view the "Instructions" stack, the computer-assisted music instruction program becomes largely self-explanatory. The first two cards address the overall use of the computer-assisted music

instruction program as well as general directions. The third card of this stack, known as the "Sessions" card, allows the student to choose the appropriate session for his or her stage in the score study process. The card marked "Session 1" takes the student to the appropriate help card, where he or she receives instructions on the first session. After reading the instructions for this session, a button on this card takes him or her to the "Biography" stack, where he or she is instructed to read the biographical information and utilize the branching feature. This feature supplies supplemental information as works for wind band by Holst. The first session is intended to familiarize the student with the use of the computer-assisted music instruction program. Additionally, it is intended to familiarize the student with the composer through a biographical overview. The student is also encouraged to browse through the program during this session if he or she so desires.

Session Two - Score Orientation

The student is first instructed to return to the "Sessions" card of the computer-assisted music instruction program. This card takes him or her to the appropriate card of the "Instructions" stack. Information on the Score Orientation step of the study is contained within this card. A button takes the student to the "Score" stack, where he or she is first introduced to the condensed score of the First Suite in E-Flat, by Gustav Holst. The student is instructed

to move freely through the score, observing and concentrating only on the surface information. A list of specifics to observe is included, along with information regarding the branching feature of this stack. As the student encounters an unfamiliar musical term in the score, he or she may click on that term and move to the appropriate card in the "Glossary" stack which supplies the definition. He or she should not to attempt to read the music at this time, but rather familiarize him or herself with the overall appearance of the score and the information readily obtainable there. As stated before, the use of a full score is optional, but recommended.

Session Three - Score Reading

As before, the student moves through the Index to the "Sessions" card, and then to the fifth and sixth cards of the "Instructions" stack. These contain information on the Score Reading step of the study. The student is instructed to insert the audio CD into the caddy and then to load the caddy into the computer. Again, a button takes the student to the "Score" stack, where he or she begins a read-through of the music. A variety of approaches to hear the music are suggested, including solfege or the use of a piano keyboard, but the emphasis and primary task for the student is to attempt to "hear" the music in his or her mind. The use of any external mechanism is discouraged until a sincere attempt is made to imagine the sounds contained in the score. When a

point is reached that the student feels familiar with the entire work, it is suggested that he or she then utilize the audio CD and listen to the recording as he or she follows the score. He or she may pause or stop the CD at any time in order to examine the score more closely. He or she may also repeat any or all of this process as many times as necessary in order to become comfortable with the entire work.

Session Four - Score Analysis (Phase One)

After developing a familiarity with the work under study, it is necessary for the student to delve more deeply into the internal elements. Therefore, the Score Analysis portion of the program has three phases. Upon entering the program, the student is instructed to proceed to Session Four. Instructions are given before the student moves on to the appropriate card. Phase One of the Score Analysis step of the study involves the use of the "Analysis" stack. After reading the instructions for this step, a button takes the student to this portion of the program. Each card contains one or more notated musical examples from the score, each a separate musical event. The notation is accompanied by a brief description of the event. A button allows the student to hear the excerpt played by the audio CD. The student is asked to complete the entire work in one session and is allowed to repeat each event as many times as desired.

Session Five - Score Analysis (Phase Two)

The second phase of the Score Analysis step involves an examination of the phrase structure of the work. The "Sessions" card takes the student to card eight of the "Instructions" stack. This card supplies the necessary information before continuing on to the "Score" stack. The student is instructed to observe the numerical groupings beneath the score, indicating the structure of the various phrases and periods in each movement. It is suggested that the student first observe each phrase, drawing on the familiarity gained during the previous sessions to imagine the sound. Then, the student may listen to the audio portion of the CD in order to hear the phrase in performance. By using the "Pause" button between phrase examinations, it is possible to study the overall phrase structure of the work by its individual components.

Session Six - Score Analysis (Phase Three)

Session Six of the study is the final phase of the "Score Analysis" step and of the computer-assisted music instruction program. The student returns to the "Sessions" card, then to card nine of the "Instructions" stack. This phase utilizes the remaining stack of the program, entitled "Play". The student is instructed to choose one of the buttons on the introductory card of this stack in order to move to a specific movement of the work. Each card contains

a CD controller display as well as a listing of the musical events contained in the movement. It is recommended that the event listings are used to quiz the student's knowledge of the work by first imagining the event, then clicking on the corresponding listing and listening to the audio playback to check the accuracy of memory. It is also recommended that the student first perform this task in the event order, then choose events at random to further test his or her memory. At any time, he or she may select any movement for further study and review. At the conclusion of this step, the student is encouraged to roam freely throughout the program and revise any areas he or she wishes.

The process to be followed for this six-session study illustrates the progressive levels of knowledge addressed in the computer-assisted music instruction program as well as the researcher-developed test. This process first involves developing a familiarity with both the composer and surface details of the score. The student then develops score reading skills from a visual standpoint, and finally delves into the internal structure of the work and surely checks the knowledge gained. There is some freedom possible for the student during each step, however, the progression is specifically outlined for each session. In this manner, the student covers the entire work during the six sessions in three weeks and develops some level of intimacy with the work in a progressive manner, resulting in some degree of recall

At the conclusion of the three-week study period, all students are given the posttest. This is the same dependent measure used as the pretest.

Statistical Analysis

The mean scores for both groups are obtained for the pretest and the posttest and then compared. The pretest scores are compared to determine whether the groups are statistically equivalent. The posttest scores are compared in order to ascertain whether the experimental treatment (the supplemental use of the computer-assisted music instruction program) produces a greater change than the control situation (the traditional classroom instruction alone). Mean scores are compared for each of the three subtests as well as the total mean scores. In addition, the amount of gains from pretest to posttest are compared for both groups. The significance of the difference in average changes is determined by an analysis of variance (ANOVA). It is determined that the .10 level of significance is sufficient to reject the null hypothesis in each instance.

In addition to the analysis of variance procedure to be performed on the primary and additional research hypotheses, a t-test of statistical equivalence is necessary in order to establish that both groups are statistically equivalent at the time of the pretest. Also, the internal consistency measure of the researcher-developed test will be calculated using Cronbach's alpha in order to insure that the test

instrument measures the information for which it was designed.

Pilot Study

A pilot study testing the feasibility of the computer-assisted music instruction program is needed in order to assess the appropriateness and practicality of the program, to test the hypothesis in a preliminary manner, and to demonstrate the adequacy of the research procedures that were selected. An instrumental conducting class at Harding University will be randomly divided into two groups and then given the pretest. The control group will receive from the instructor the necessary information for a method of score study. The First Suite in E-Flat for Military Band will be assigned as the work under study, and the score and an audio recording will be made available to the students. The work will be under study for a period of three weeks, after which time the class will take the posttest to determine the degree of knowledge gained during the study. The experimental group will receive the normal classroom instruction and will be assigned to use the computer-assisted music instruction program in addition. This group will follow the six-session format described above during the three weeks of study, and then take the posttest with the control group. It will then be determined whether there is any significant difference between the pretest and posttest scores of both groups. Following the collection of this data, it will be determined

if the research plan is a viable one, and if the computer-assisted music instruction program is in need of refinements, revisions, deletions, or additions. The results of the pilot study follow.

Results of Pilot Study

A class of ten undergraduate conducting students at Harding University was divided randomly by assigning alternating alphabetical names from the class roster to the control and experimental groups. The entire class was given the pretest, followed by the three-week treatment in the case of the experimental group. The two group's mean scores were within 5% on the pretest. The control group received no contact with the computer-assisted music instruction program, but only the regular classroom instruction.

Following the three-week period, the entire class was again given the test. The results showed a 16% increase in the mean scores of the experimental group, while the control group displayed no change in the average scores. In addition, the experimental group exhibited an increase of 26% in Section One (Score Orientation), an increase of 4% in Section Two (Score Reading), and an increase of 9% in Section Three (Score Analysis). The control group experienced a 1% drop in average scores for Section One, no change in Section Two, and a 3% drop in Section Three, for a total decrease of 1% in the mean total scores. The experimental group expressed a positive attitude toward the computer-assisted music instruction program as indicated by an opinion

questionnaire completed after the final session. Revisions were needed in order to make the program easier to follow with clearer directions. As a result, the "Instructions" stack was modified to include the "Sessions" cards described previously. Also, the suggested contact time with the computer-assisted music instruction program was increased from 30 minute sessions to one hour, as students in the experimental group felt that more time was needed. In addition, both groups expressed some concern with the format of the test, primarily with the lack of proximity of the answer sheets to the appropriate questions. These problems were resolved for the actual study.

The results of the pilot study seemed to indicate a positive effect on the experimental group through use of the computer-assisted music instruction program. It was therefore determined that the actual study would proceed as planned.

CHAPTER 4
RESULTS

Introduction

The purpose of this study was to (a) develop a computer-assisted music instruction program as an aid to score study, using a specific work from the wind band repertoire as a model and (b) test its effectiveness in improving knowledge of the work as measured by a researcher-developed test.

Two basic questions were addressed: (1) Can the computer be used to effectively supplement regular classroom instruction in the area of score study for instrumental wind band conductors? (2) Can knowledge of a musical work be improved for the undergraduate instrumental wind band conducting student through the use of a computer-assisted music instruction program designed for that purpose?

In order to fully answer these questions, data were collected in the form of pretest and posttest scores as well as other pertinent statistical information, with the goal of determining whether the independent measure (the computer-assisted music instruction program) had any significant effect on the pretest-posttest (the dependent measure) scores for the experimental group.

Statistical techniques were selected to provide data relevant to the difference between the experimental and control groups' pretest-posttest scores on each of the three subsections of the test, and the difference between the experimental and control groups' pretest-posttest total scores. Additional analyses are presented as they relate to differences between individual institutions (designated A, B, C, and D) on the pretest-posttest gain scores, the gains made from pretest to posttest by the experimental and control groups, and the differences in the amount of gains by each group. As discussed in Chapter Three, the .10 level of significance was determined to be sufficient to reject the null hypothesis and accept the research hypothesis in each instance.

Each hypothesis and related information will be reviewed and then presented with its corresponding data along with an explanation of the findings. The data are presented and discussed in the following order: (a) test for internal consistency in the dependent measure (researcher-developed test), (b) test for statistical equivalence between groups at the time of the pretest, (c) significance level of the total test, (d) comparison of experimental and control groups' pretest-posttest gain scores, (e) comparison of experimental and control groups' mean total gain scores, (f) experimental and control groups' mean gain scores and significance level on each of the three test subsections, (g) comparison of experimental and control groups' mean total gain scores on

each of the three test subsections, and (h) comparison of individual institutions. A summary of results concludes the chapter.

Presentation of Data

Internal Consistency Measure for the Test Instrument

The test instrument utilized was a researcher-developed test and in its initial use. Therefore, it was necessary to evaluate the internal consistency of the measure in order to maintain a valid investigative procedure. The test instrument had been evaluated for content prior to its use by the instructors at the various institutions participating in the study and subsequently revised in order to establish validity. Table 1 below contains the variance values for each of the three subtests and for the entire instrument. These values indicate the consistency with which the instrument measures the information for which it was designed. The internal consistency measure was calculated using coefficient alpha (also known as Cronbach s alpha) since the responses are not all dichotomous. The formula used is as follows:

$$\alpha = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum \sigma^2_{item}}{\sigma^2_{instrument}}\right)$$

Coefficient alpha values range from 0 to 1, with one being a perfectly consistent measure. The alpha values were p = .66 for Subtest 1, p = .77 for Subtest 2, and p = .77 for Subtest 3. The total test produced a value of p = .78. These values should be considered acceptable, as the instrument is in its first use since design. However, since the value is less than 80 percent, the test should undergo additional revisions before it is used again. In addition, some items in the third subtest showed little or no variance, indicating that they are not contributing substantial information to the measure. Subtest 1 contained only 13 items, which prevents an accurate measurement of consistency. For this reason, the alpha value is lower than in subtests 2 and 3. The second subtest contained 41 items and the third 40 items, which lend a more accurate indication of the measure of consistency. These values also are more indicative of the measure on the overall test instrument.

Table 1. Coefficient Alpha Measure for Internal Consistency

SUBTEST	Item Var.	Sum.	Subtest Var.	Alpha Value
1	1.537301		3.925885	.659121
2	13.37896		56.38214	.772364
3	6.352479		25.84953	.767036
TOTAL TEST	21.26874		95.15599	.783934

t-test to Verify Statistical Equivalence at the Pretest

A t-test of statistical equivalence was performed to insure that both the experimental and control groups are equal at the time of the pretest so that any gains

experienced may be attributed to the experimental treatment rather than to any prior condition that may have existed. Table 2 below displays the results of this procedure. The groups are labeled C (Control) and E (Experimental), and the number of subjects in each group is 22. The Mean, or average scores for each group are presented next, followed by the Standard Deviations. Next, the Standard Error is displayed, followed by the Minimum and Maximum raw scores for each group. The area beneath the table indicates the Variances, Degrees of Freedom, and the Probability that the groups are equal at the .10 level of significance. Results indicate that the groups were statistically comparable at the time of the pretest at the test significance level of .10 ($p = .7890$). This indicates that there is no statistically significant difference between the groups in scores obtained on the pretest.

Table 2. t-test Procedure for Statistical Equivalence

GROUP	n	M	SD	SE	Min.	Max
E	22	41.00	8.87	1.89	24.00	61.00
C	22	4.36	6.64	1.41	29.00	53.00

Var	T	DF	Prob>T
Unequal	.2693	38.9	.7891
Equal	.2693	42.0	.7890

Primary Research Hypothesis

The primary research hypothesis for this study is that students who use a computer-assisted music instruction program to supplement instruction in the area of score study

will improve their knowledge of a specific wind band [illegible] more than students who do not use a computer-assisted music instruction program as evidenced by their performance on the researcher-developed test. The corresponding null hypothesis is that there will be no statistically significant difference in the posttest scores on the modal work between students using the computer-assisted music instruction program as an aid to score study and students not using the program.

Significance of Total Scores

Table 3 below displays the significance of the differences between the experimental and control groups on the posttest scores. As previously discussed, it was determined that the .10 level of significance was sufficient to reject the null hypothesis, as the study and the measurement instrument are both in their initial use. Results show that the differences between the groups achieved a value of p = .0659, which is within the .10 significance level.

Table 3. Significance of Differences Between Groups Total Posttest Scores

Source	SS	df	MS	F	p
GROUP	227.27	1	227.27	3.56	.0659
TOTAL	2904.90	42			

It should also be noted that these alpha values represent the differences between groups on the posttest scores. When comparing the amount of gains from pretest to posttest between the groups, the first two subtests continue

to display non-significant differences between the groups (p = .1994 and p = .4371, respectively), and the third subtest a significant difference (p = .0564). These values are comparable to those obtained for the differences between groups on the posttest scores. However, the total test displays a value of p = .0447 when analyzing the differences in the amount of gains, which is significant at the .05 level (see Table 4 below).

Table 4 Significance of Differences in the Amount of Gains from Pretest to Posttest

Source	SS	df	MS	F	p
GROUP	295.36	1	295.36	4.28	.0447
TOTAL	3191.18	43			

In addition, the significance of total gains from pretest to posttest for each group individually display alpha values of p = .1235 for the Control group and p = .0015 for the Experimental. Displayed in Table 5, this indicates a statistically significant increase in gains for the Experimental group at the .05 level.

Table 5: Significance of Total Gains from Pretest to Posttest for Each Group

Source	SS	df	MS	F	p
GROUP C	189.39	1	189.39	2.59	.1235
TOTAL	1654.00	22			
GROUP E	372.11	1	372.11	13.46	.0015
TOTAL	1654.00	22			

Experimental and Control Groups' Total Scores

Table 6 below displays the pretest, posttest, and gain scores for the experimental and control groups. The gain scores indicate the difference in the amount of improvement by each group. The experimental group's total gain score was 12.4, and the control group's total gain score was 7.3. It is evident that the pretest scores are comparable between the groups, as indicated by the means displayed for each. Following the posttest, there is a greater difference in the scores between the groups, with the experimental group achieving a higher score. Although the control group experienced gains from the pretest to the posttest, the experimental group displayed greater gain scores, indicating a greater degree of improvement.

Table 6: Means and Standard Deviations of the Experimental and Control Groups' Pretest, Posttest, Gain Scores

		Pre		Post		Gain	
Group	n	M	SD	M	SD	M	SD
E	22	40.4	6.6	52.8	6.49	12.4	1.87
C	22	41.0	8.9	48.3	8.6	7.3	5.58

Comparison of Gain Scores

Table 7 below displays the mean gain scores for each group. The experimental group achieved greater gains in all subtests as well as on the total measure. This occurred despite the fact that the Control group at institution D experienced greater gains than did the Experimental group, as

indicated in Table 12 below. In addition, the Control group at institution C displayed negative gain scores from the pretest to the posttest (see Appendix A for raw scores).

It may also be noted that the greatest gains experienced by both groups were obtained on Subtest 1, Score Orientation. The Experimental group achieved a gain score of 21.5 and the Control group 14.9. Subtest 2, Score Reading, experienced the least gains of the three subtests, but also displayed the highest scores at the pretest. The Experimental group displayed a gain score of 4.2 and the Control group 1.6 on this subtest. Finally, Subtest 3 (Score Analysis) is the only subtest that indicated a significant difference between the groups at the .10 level ($p = .0525$; see Table 10). The Experimental group obtained a mean gain score of 9.7, and the Control group 4.8.

Table 7: Experimental and Control Groups' Mean Gain Scores

Group	n	Subtest 1	Subtest 2	Subtest 3	Total
E	22	21.5	4.2	9.7	12.4
C	22	14.9	1.6	4.8	7.3

Therefore, the primary research hypothesis that the computer-assisted music instruction program had a significant effect on the posttest scores of the experimental group over those of the control group is accepted. The corresponding null hypothesis may be rejected since the groups were determined to be statistically equivalent at the time of the pretest.

First Additional Hypothesis

The first of the three additional hypotheses is that students who use the computer-assisted music instruction program designed to supplement classroom instruction in the area of score study will demonstrate a greater recall of the basic surface details of the score than students who do not use the computer-assisted music instruction program. The corresponding null hypothesis is that there will be no statistically significant difference in the posttest scores on Section One of the test, entitled Score Orientation, which requires basic knowledge of surface information contained in the score, between student using the computer-assisted music instruction program as an aid to score study and students who do not use the program.

Significant Differences Between Posttest Scores - Subtest 1

As it was necessary to develop additional hypotheses in order to determine the effectiveness of the computer-assisted music instruction program on each of the three subtests, a separate analysis of variance procedure was used to determine the significance level of differences in gain scores from the pretest to the posttest between the Experimental and Control groups for each subtest.

Table 8 below displays the results of Subtest One, entitled Score Orientation. This subtest addressed the surface details of the score, which include the following:

1. title of the work
2. composer's name and dates

3. date of composition
4. number, titles, and definitions of movements
5. key and meter signatures
6. basic tempos of each movement
7. performance time of each movement and the entire work
8. definitions of various musical terms found in the score
9. other works for the wind band by the composer

Preparation for this subtest by the experimental group occurred in Sessions 1 and 2 of the computer-assisted music instruction program.

As indicated in Table 8, the first subtest achieved a value of $p = .2438$. This indicates a non-significant difference in the posttest scores between the experimental and control groups. The Control group achieved significant gains at the .10 level from pretest to posttest ($p = .0896$), while the Experimental group did not ($p = .1295$). It is unclear as to why this occurred. However, the differences in the amount of gains as well as the differences in posttest scores are non-significant on this subtest.

Therefore, it is concluded that the supplemental treatment of the computer-assisted music instruction program had no significant effect over the traditional classroom instruction, and the null hypothesis must be accepted in this instance.

Table 8: Difference Between Experimental and Control Groups Subtest 1 Posttest Scores

Source	SS	df	MS	F	p
GROUP	295.36	1	295.36	1.40	.243#
TOTAL	9171.18	43			

Second Additional Hypothesis

The second additional hypothesis is that students who use the computer-assisted music instruction program designed to supplement classroom instruction in the area of score study will be able to identify visual excerpts from the score and recall specific information regarding each excerpt with a greater degree of accuracy than students who do not use the computer-assisted music instruction program. The corresponding null hypothesis is that there will be no statistically significant difference in the posttest scores on Section Two of the test, entitled Score Reading, which requires visual familiarity with the score, between student using the computer-assisted music instruction program as an aid to score study and students who do not use the program.

Significant Differences Between Posttest Scores - Subtest Two

Table 9 below displays the results of the second subtest, Score Reading. In this subtest, each student viewed excerpts from the score and then answered questions regarding basic information found in a mental reading of the excerpt. The specific information requested in this portion includes the following.

1. meter
2. key
3. voice containing the melodic line
4. the predominant texture
5. the predominant dynamic level
6. any changes of key or meter that may be present
7. the predominant style
8. the relative thickness of the scoring

Session 2 of the computer-assisted music instruction program addressed the information and skills necessary for this portion of the test.

The analysis of variance on Subtest 2 resulted in a value of p = .1609, which is above the .10 level required for a significant difference between the groups. In addition, this subtest displays the lowest gain scores for both groups, as seen in Table 6 above. However, the Experimental group did achieve significant gains from pretest to posttest (p = .0851). In addition, the difference in the amount of gains from pretest to posttest between the two groups was non-significant (p = .4371). As the Control group also did not achieve significant gains (p = .5915), there is no statistically significant difference in the posttest scores between the groups.

Therefore, it must be concluded that the supplemental use of the computer-assisted music instruction program did not have a significant effect on the posttest scores of the experimental group. It is not possible to reject the null hypothesis in this instance.

Table 9. Differences Between Experimental and Control Groups' Subtest 2 Posttest Scores

Source	SS	df	MS	F	p
GROUP	156.56	1	156.56	2.04	.1609
TOTAL	3384.25	43			

Third Additional Hypothesis

The third and final additional hypothesis is that students who use the computer-assisted music instruction program designed to supplement classroom instruction in the area of score study will be able to identify aural excerpts from the work and recall specific information regarding each excerpt with a greater degree of accuracy than students who do not use the computer-assisted music instruction program. The corresponding null hypothesis is that there will be no statistically significant difference in the posttest scores on Section Three of the test, entitled Score Analysis, which requires aural familiarity with the score, between students using the computer-assisted music instruction program as an aid to score study and students who do not use the program.

Significant Differences Between Posttest Scores -- Subtest 3

Table 10 displays the results of the third subtest, entitled Score Analysis, which utilizes aural excerpts from the work. In this portion of the test, the students were required to identify the following:

1. movement from which the excerpt is taken
2. the musical event, such as a variation, primary or secondary theme or combination of themes
3. the phrase structure of the excerpt
4. the tempo or metronome marking
5. the predominant instrument(s)
6. whether the excerpt is in a major or a minor mode.

Students in the experimental group received information necessary for this subtest in sessions 4-6 of the computer-

assisted music instruction program, which includes three distinct phases of the analysis step.

Phase One of the Score Analysis step introduced a thematic analysis of the work. In Phase Two, the student examined a phrase analysis. In the third and final phase, the student was asked to choose musical events at random from a list and attempt to identify each mentally before listening to the excerpt. All three sessions comprised the Score Analysis portion of the score study process.

It was found that the treatment had a statistically significant effect at the .10 level for the third subtest ($p = .0525$). This value is within the acceptable range, and allows the rejection of the null hypothesis and the acceptance of the research hypothesis in this instance. Both groups experienced significant gains from the pretest to the posttest. The Control group achieved an alpha value of $p = .0969$, which is significant at the .10 level. The Experimental group experienced significant gains at the .05 level ($p = .0080$). However, those experienced by the experimental group were greater than those by the control group ($F = .0564$).

Therefore, it is concluded that the computer-assisted music instruction program had a significant effect on the posttest scores of the experimental group over those of the control group and was an effective supplement in this area over the traditional classroom approach alone.

Table 10: Difference Between Experimental and Control Groups Subtest 3 Posttest Scores

Source	SS	df	MS	F	p
GROUP	196.56	1	196.56	3.98	.0525
TOTAL	227.43	43			

Comparison of Test Subsections

Table 11 below displays the mean pretest, posttest, and gain scores for each of the three subsections of the test for each group. Gains were experienced by both groups on each subtest, ranging from a score of 1.6 to a high score of 21.5. It is evident that the greatest gains were made in Section One (Score Orientation). This section also displayed fairly low mean scores at the time of the pretest. Section Two (Score Reading) indicated the lowest gain scores of the three sections. However, this section also displayed the highest mean scores at the time of the pretest. As noted above, subtests 1 and 2 did not result in significant differences in gain scores between the two groups.

The final section (Score Analysis) produced statistically significant gains at the .10 level as determined by the statistical analysis and displayed in Table 10. The analysis of variance performed on the third section, as well as on the total posttest score, allows the rejection of the null hypothesis in both cases. This indicates a significant difference between the posttest scores of the Experimental and Control groups.

Table 11: Means of the Experimental and Control Groups Subtest Pretest, Posttest, Gain Scores

Grp.	n	Pre1	Pst1	Gain	Pre2	Pst2	Gain	Pre3	Pst3	Gain
E	22	31.8	53.4	21.5	61.4	65.6	4.2	28.5	38.2	9.7
C	22	33.4	48.3	14.9	60.3	61.9	1.6	29.2	34.0	4.8

Comparison of Total Scores for Individual Institutions

Table 12 below displays the total mean pretest, posttest, and gain scores for each institution. Since all subjects were determined to be equal at the time of the pretest as indicated by the t-test procedure (see Table 1), it is unclear as to why the control group at institution D displayed higher gains than the experimental group at that institution. This group also demonstrated the greatest gains of any group participating in the investigation as well as the lowest mean scores at the time of the pretest. It is also interesting to note the negative gain scores displayed by the Control group at institution C, which indicate that no learning took place from the pretest to the posttest under traditional classroom instruction.

The mean scores at the individual institutions range from 36.8 to 44.3 at the time of the pretest, indicating a closely grouped range of scores. Following the posttest, the Experimental groups at the individual institutions displayed mean scores from 49.4 to 55.6, maintaining a uniform cluster of scores. In contrast, the Control groups' scores ranged from 42.0 to 52.6, which is a more widespread scattering.

Table 12. Means and Standard Deviations of the Experimental and Control Groups' Total Pretest, Posttest, Gain Scores by Institution

			Pre		Post		Gain	
Inst	Grp	n	M	SD	M	SD	M	SD
A	E	3	44.3	7.14	54.7	4.19	1.30	2.50
	C	3	39.3	2.35	43.0	3.56	3.70	1.24
B	E	8	4.70	7.14	55.6	7.43	14.9	4.74
	C	8	42.6	8.48	52.6	5.31	1.00	3.74
C	E	6	4.70	5.96	51.0	6.45	1.30	7.65
	C	6	43.8	9.23	42.0	1.77	-1.8	1.86
D	E	5	37.0	5.18	49.4	5.57	12.4	2.73
	C	5	36.0	8.41	52.0	5.02	16.0	11.63

Summary of Results - Primary Hypothesis

As indicated above, the experimental group displayed a gain score of 12.4, which is statistically significant at the .10 level of significance (p = .0659). The gains made by the control group were non-significant at this level. The gains made by the experimental group were higher than those of the control group, which displayed a gain score of 7.3. Also, the differences in the amount of gains made by the Experimental group were significant at the .05 level (p = .0447). These results indicate that the use of the computer-assisted music instruction program had a significant effect on the posttest scores of the Experimental group over those of the Control group, and that the primary research hypothesis may be accepted. Therefore, since both groups were determined to be statistically equivalent at the time of the pretest, the null hypothesis is rejected

Summary of Results - First Additional Hypothesis

The first of the additional hypotheses relating to the various subtests of the overall measure addressed the area of basic surface details of the score. This hypothesis indicates that students who used the computer-assisted music instruction program would demonstrate a greater recall of this information than the students not using the program. However, the test for significant differences between the groups displayed a value of $p = .2438$, which is non-significant at the .10 level. It must be concluded that in the area of Score Orientation, the supplementary treatment of the computer-assisted music instruction program did not have a significant effect over the traditional classroom instruction. Therefore, the null hypothesis is accepted in this area.

Summary of Results - Second Additional Hypothesis

The second subtest required subjects to identify visual excerpts from the score. The related additional hypothesis indicated that students who use the computer-assisted music instruction program would demonstrate a greater degree of accuracy in identifying the excerpts than students not using the program. The test for significant differences between groups on this section displayed a value of $p = .1609$, which is non-significant at the .10 level. It is concluded that in

the area of Score Reading, the supplemental treatment did not have a significant effect on the experimental groups pretest-posttest gain scores over those of the control group. Therefore, the null hypothesis must be accepted in this case as well

Summary of Results - Third Additional Hypothesis

The third additional hypothesis indicates that students who use the computer-assisted music instruction program designed to supplement classroom instruction in the area of score study will be able to identify aural excerpts from the work and recall specific information regarding each excerpt with a greater degree of accuracy than students who do not use the program In this case, the test for significance differences between the groups revealed a value of $p = .0525$, which is statistically significant at the .10 level. It is concluded that in the area of Score Analysis, the supplemental treatment of the computer-assisted music instruction program did have a significant effect on the pretest-posttest gain scores of the experimental group. Therefore, the third additional research hypothesis is accepted and the null hypothesis is rejected in this instance.

Research Questions

At the outset of this investigation, two basic questions were presented as the focus of the study: (1) Can the

computer be used to effectively supplement regular classroom instruction in the area of score study for instrumental wind band conductors? (2) Can knowledge of a musical work be improved for the undergraduate instrumental wind band conducting student through the use of a computer-assisted music instruction program designed for that purpose?

In regard to the first question, the computer-assisted music instruction program was shown to be effective on the overall measure and in the third subtest, indicating that these areas of instruction may be effectively supplemented. The pretest-posttest gain scores clearly indicate a significant difference between the experimental group that received the treatment of the program in addition to its normal classroom instruction and the control group which received only the traditional instruction in the classroom.

The second question was concerned with improvement in the level of knowledge of the musical work as evidenced by the pretest-posttest gain scores. The experimental group displayed greater gains from pretest to posttest over the control group, indicating that supplemental instruction in the form of the computer-assisted music instruction program did indeed enhance knowledge. However, the difference in gains over the traditional non-supplemented classroom instruction were not significant in the areas of Score Orientation and Score Reading. Therefore, the knowledge of a specific work can be improved through the use of computer-assisted music instruction program designed for that purpose

In this study, the improvement in knowledge is significantly greater in the area of Score Analysis as well as the total measure.

CHAPTER 5
CONCLUSIONS

Summary of Research Study

The purpose of this study was to (a) develop a computer-assisted music instruction program as an aid to score study, using a specific work from the wind band repertoire as a model and (b) test its effectiveness in improving knowledge of the work as measured by a researcher-developed test.

Score study is recognized as an integral component in the training and instruction of conductors. Each student wind band conductor must develop the skills necessary to become knowledgeable about a score in order to be an effective conductor of an ensemble. The instrumental wind band conductor who aspires to a teaching position will utilize these skills many times in his or her career as he or she prepares the pieces he or she chooses and communicates these works to various ensembles.

It is often unclear as to how the student is to gain the necessary skills to be able to effectively study a score. The emphasis in undergraduate conducting classes is often on the technical development of the use of the baton, in communicating with the ensemble through the use of gesture, error detection, and in problem solving. Therefore, an

inequity exists in the relative importance of score study and the attention given to this topic in various writings as well as in instruction at the undergraduate level. It is then appropriate to consider supplementary methods of instruction in instrumental wind band conducting courses at the undergraduate level in order to allow students to develop these necessary skills.

Score study is defined as a "process through which music notation and other information provided in the score are systematically examined and thoroughly assimilated." (Battisti and Garofalo, p. 3) The goal of score study is twofold: (1) to develop a familiarity with the work to the point of being able to hear the work in its entirety in one's mind, and (2) to develop an interpretation of the work based on the information gained from the score and supplementary sources. A review of the available literature supports a process defined in four progressive steps:

1. Score Orientation
2. Score Reading
3. Score Analysis
4. Score Interpretation

The first three steps prepares the student for the fourth step, which is demonstrated in the rehearsal setting. An application of the first three steps may be used as a guide for the undergraduate wind band conducting student in the area of score study.

Computer-assisted music instruction in music is recognized as a valuable tool for learning by many music educators, often being used as a supplement to regular

classroom instruction at many levels from elementary through college. Computer-assisted music instruction is widely used in educational settings and seems to be a permanent tool for learning in the music classroom. It has been shown to be effective particularly in the area of supplementary instruction, specifically, to practice skills individually without the extensive use of classroom instructional time.

The majority of the music software instructional programs currently available are for drill and practice on specific concepts related to a complete music education. However, there are specific areas of study in music, such as score study, that require a more comprehensive approach and a broader base of knowledge in order for the student to become familiar with a work in its entirety. It is only recently that the computer is being utilized to handle more complex tasks requiring a comprehensive base for supplementary instruction. Unfortunately, research programs using the computer to supplement instruction in the area of score study are non-existent.

The present investigation was concerned with the development and evaluation of a computer-assisted music instruction program as an aid to score study for the undergraduate wind band conducting student. Therefore, the review of literature examined the areas of score study as well as computer-assisted music instruction, and the use of the computer in more complex tasks.

The need for additional research in the area of score study was justified by the review of related literature. While it is apparent that score study is an important element in the instruction of conductors, it remains relatively unstandardized and often underemphasized in regular classroom instruction at the undergraduate level. It was also discovered that there was a lack of standardized measurement tools for testing a student's knowledge of a specific work. As the computer has been used effectively to supplement classroom instruction in many areas, it seemed feasible to investigate whether the same would be true in the area of score study.

The present investigation, using a work from the standard wind band repertoire as a model, attempted to improve knowledge of the work through the use of a computer-assisted music instruction program designed specifically to assist the student in studying the score. The computer-assisted music instruction program was intended as a model for the score study process. Its application to a specific work was intended to ascertain whether the computer may be used to effectively supplement classroom instruction in this area. The computer-assisted music instruction program was designed in direct relation to the first three steps of the score study process, and served as the independent measure. A measurement tool was developed by the investigator in the form of a test designed to measure the student's knowledge of the model work. This test served as the dependent measure.

Two basic questions were addressed. (1) Can the computer be used to effectively supplement regular classroom instruction in the area of score study for instrumental wind band conductors? (2) Can knowledge of a musical work be improved for the undergraduate instrumental wind band conducting student through the use of a computer-assisted music instruction program designed for that purpose?

The primary research hypothesis for this study was that students who use a computer-assisted music instruction program to supplement instruction in the area of score study will improve their knowledge of a specific wind band score more than students who do not use a computer-assisted music instruction program. The corresponding null hypothesis was that there will be no statistically significant differences in the posttest scores on the model work between students using the computer-assisted music instruction program as an aid to score study and students not using the program.

Due to the progressive levels of study present in the computer-assisted music instruction program as well as the progressive levels of knowledge required for successful completion of the test, it was necessary to investigate three additional research hypotheses as well as the primary hypothesis. These additional hypotheses correspond to the three subtests of the dependent measure.

The first of the additional research hypotheses was that students who use the computer-assisted music instruction program designed to supplement classroom instruction in the

area of score study will demonstrate a greater recall of the basic surface details of the score than students who do not use the computer-assisted music instruction program. The corresponding null hypothesis was that there will be no statistically significant difference in the posttest scores on Section One (Score Orientation) of the test, which requires basic knowledge of surface information contained in the score, between student using the computer-assisted music instruction program as an aid to score study and students who do not use the program.

The second additional hypothesis was that students who use the computer-assisted music instruction program designed to supplement classroom instruction in the area of score study will be able to identify visual excerpts from the score and recall specific information regarding each excerpt with a greater degree of accuracy than students who do not use the computer-assisted music instruction program. The corresponding null hypothesis was that there will be no statistically significant difference in the posttest scores on Section Two (Score Reading) of the test, which requires visual familiarity with the score, between student using the computer-assisted music instruction program as an aid to score study and students who do not use the program.

The third and final of the additional hypotheses was that students who use the computer-assisted music instruction program designed to supplement classroom instruction in the area of score study will be able to identify aural excerpts

from the work and recall specific information regarding each excerpt with a greater degree of accuracy than students who do not use the computer-assisted music instruction program. The corresponding null hypothesis was that there will be no statistically significant difference in the posttest scores on Section Three (Score Analysis) of the test, which requires aural familiarity with the score, between students using the computer-assisted music instruction program as an aid to score study and students who do not use the program.

The present study utilized existing classes of undergraduate wind band conducting students at four universities. Each class was randomly divided into two groups, half in the control group and half in the experimental. In all, a total of 44 students participated in the investigation. The no-contact control group continued with their regular classroom instruction, while the experimental group completed six sessions over a three-week period with the computer-assisted music instruction program in addition to their regular classroom instruction.

The study was conducted in the spring and summer of 1995 at four universities: Augustana College, Morehead State University, the University of Florida, and Western Kentucky University. The initial pilot study, completed at Harding University, indicated that the treatment period of six sessions over a three-week period would allow students in the experimental group sufficient interaction with the computer-assisted music instruction program. The no-contact group

received only the normal classroom training given by their instructors in the area of score study.

The computer-assisted music instruction program was designed and executed on the MacIntosh computer, since many institutions have these computers available and in frequent use for educational and musical applications. In addition, the Hypercard programming toolkit is available only on the Macintosh. Hypercard allows the user to design and utilize programs customized to his or her needs without purchasing commercial applications. The program was designed and executed in direct relation to the three-step process of score study identified earlier in this chapter.

Results revealed no statistically significant difference between the control and experimental groups following the pretest. A significant difference was present following the treatment, indicated by the difference in posttest scores ($p = .0659$). Results also indicated that the experimental group made statistically significant gains ($p = .0015$) at the .05 level of significance from pretest to posttest on the dependent measure (researcher-developed test). The gains made by the experimental group were also significantly higher on the total measure ($p = .0447$) than those made by the control group. This would indicate that the use of supplemental computer-assisted music instruction improves performance on measures relating to score study. In addition, the data show no significant difference between the experimental and control groups from pretest to posttest on

Subtests 1 and 2, but that a statistically significant difference in scores did exist on Subtest 3.

Discussion

In order to make use of data obtained in this investigation, it is necessary to formulate possible explanations for the results and suggest practical applications for the findings. Therefore, results of the study are discussed in the following order: (a) inherent difficulties of "real world" investigations, (b) findings regarding the researcher-developed test instrument, (c) examination of conducting curricula at each institution, (d) equivalence of groups at the pretest, (e) the primary research hypothesis and significance of the total scores, (f) the first additional research hypothesis and scores on Subtest 1, (g) the second additional research hypothesis and scores on Subtest 2, (h) the third additional research hypothesis and scores on Subtest 3, (i) discussion of time spent on and attitudes toward the computer-assisted music instruction program by the Experimental group and, (j) summary.

Inherent Difficulties of "Real World" Investigations

The investigation of actual classroom situations present unique difficulties in which all factors cannot be controlled. There are differences in students, instructors, curricula, class sizes, emphasis, and other factors which may

affect the outcome of the study. A convenient sample was used, i.e. pre-existing classes, each at different institutions along with small numbers of subjects. In addition, the instructors differed in their approach to the material. To illustrate, a cluster of negative difference scores appeared at one institution. (These scores may be viewed in Appendix A.) These factors are inherent in studies of realistic conditions, as opposed to investigations where all factors may be perfectly controlled. However, studies of this type lend a more realistic view of the practical application of the data gained from the investigation.

Although the research design in this investigation involved the use of an experimental and a control group, there was in actuality no control group. The group designated "control" in this study did in fact receive a treatment; the traditional classroom instruction. This study is actually a comparison of two treatments rather than a treatment and control design. Again, the overall results indicate that the supplemental use of the computer-assisted music instruction program is a more beneficial approach than traditional classroom instruction alone. It is not possible from this study to know the results of a true control group, i.e. one that received no treatment, participating in the investigation. It is possible that both present groups would show significant improvement at the .05 level over a true control group. This three-group design is suggested for

future investigation in the section entitled "Recommendation for Further Research" (see below).

Researcher-Developed Test Instrument

As stated in Chapter 4, the researcher-developed test used to measure the level of knowledge regarding the modal work was in its initial use. In order to determine that the test was measuring the information for which it was designed, coefficient alpha was used to establish internal consistency for each subtest as well as on the total measure.

Subtest 1 received an alpha value of p = .66 in measuring recall of the surface details of the score. However, it should be noted that this subtest contained only 13 items, which creates difficulty in obtaining an accurate indication. The lower alpha value could be attributed to this reason. Subtest 2 obtained a value of p = .77 with 80 items and Subtest 3 a value of p = .77 with 60 items. The total measure obtained an alpha value of p = .78. This should be considered an acceptable level, since the test is in its initial use.

It must be noted, however, that some items in Subtest 3 showed little or no variance, indicating that they contributed no substantial information to the measure. These items should either be removed, replaced, or possibly addressed more clearly in the computer-assisted music instruction program before the test instrument is used again. Two items in particular showed little or no variance. One

dealt with identifying the specific musical event, such as a certain variation or particular theme. The other addressed the phrase structure and asked the student to outline the specific phrase as supplied in the computer-assisted music instruction program. In each case, it is possible that the contact time was not sufficient to develop this level of familiarity. It is also possible that the students did not understand the question even after experiencing the treatment. There may not have been not enough time to answer these questions accurately in the test format. Feedback in the form of an opinion questionnaire completed by students in the Experimental group indicated that some did not fully understand what the question was asking. This matter should be resolved prior to future investigations.

Examination of Conducting Curricula

Using an instructor questionnaire (which may be found in Appendix F) as well as syllabi provided by the instructors at each of the participating institutions, it was possible to determine the curriculum followed by each class. The questions addressed nine areas of concern. Although only one instructor returned the questionnaire, it was possible to determine some of the requested information from the course syllabi. A discussion of this information follows.

Question 1 addressed the conducting text(s) used in class for each institution. In all, readings from twelve different texts were required by the instructors, with only

one text common to all (The Modern Conductor, Green, 1985).In addition, only one instructor required the Guide to Score Study for the Wind Band Conductor (Battisti and Garofalo, 1990).

The second question requested information on which semester of study included instruction in score study. One instructor addressed this topic at the end of the fall semester, while the others were in the second semester.

The number of class meetings devoted to the topic of score study varied somewhat. Two instructors reserved four class periods specifically for this subject. Another designated six periods to score study, while the fourth syllabus was unclear as to the amount of time spent. However, this instructor listed the Guide to Score Study for the Wind Band Conductor as a required text. It is interesting to note that students at the institution using six class meetings to address score study experienced the greatest gains from pretest to posttest.

Question 4 requested a brief outline of the preferred method of instruction in the area of score study. Although it was not possible to fully determine this from the syllabi, the instructor who returned the questionnaire included a procedure and checklist for score preparation. An approach to score study by a contemporary conductor (John Paynter, Northwestern University) was provided to the students as well.

All four instructors indicated one or more works to be studied during the semester, with two listing specific pieces. In addition, the same two listed the First Suite in E-Flat for Military Band (Holst) as a required work.

It was not possible to determine whether each instructor required their students to follow a specific method or process of score study. However, one did indicate that he provided several methods from which the students could choose.

In a question regarding testing of student's knowledge of a work, one instructor listed the analysis of general information contained on score pages as one method, with specific knowledge being evidenced through actual conducting. All indicated testing through conducting evaluation as well as written exams on problem solving and listening.

None of the four instructors indicated the use of computer-assisted music instruction in the area of score study. In addition, this method of instruction was not utilized in any aspect of conducting study during the class.

The final question requested suggestions and comments regarding the computer-assisted music instruction program utilized in the present investigation. The single responding instructor was enthusiastic and complimentary about the program, and indicated that the students found it easy to use and effective.

Further investigation is needed into a conducting curriculum and its correlation to effective score study.

This is addressed at the end of this chapter in the section entitled "Recommendations for Further Research".

Equivalence of Groups at the Pretest

It is important to be able to attribute any significant differences between the Experimental and Control groups' gain scores to the treatment in order to verify the research hypothesis. Therefore, the possibility of any pre-existing situation being responsible for the differences must be eliminated. A t-test procedure of statistical equivalence was performed on the pretest scores of both groups in order to verify that they were equal. Results showed a value of p = .7498, which indicates that the two groups were equivalent at the .10 level of significance. This verifies that there were no statistically significant differences between the groups in scores on the pretest.

Primary Research Hypothesis and Significance of Total Scores

Since the two groups were shown to be statistically equivalent at the pretest, significant differences in posttest scores may be attributed to the treatment. Results displayed differences at a level of p = .0659 on the total measure, which indicates that the treatment is responsible for the difference in scores. Therefore, on the total measure, there is a less than 10% possibility, as required by the .10 level of significance, that these changes occurred by chance. The differences in the amount of gains obtained by

the groups were significant at the .05 level (p = .0447). In addition, the gains experienced by the Experimental group from pre to posttest were significant at this level (p = .0015). Despite obtaining non-significant differences on the first two subtests, the primary research hypothesis is therefore accepted and the null rejected.

First Additional Research Hypothesis and Significance of Scores on Subtest 1

The first subtest, Score Orientation, displayed an alpha value of p = .2438. This was the lowest difference in posttest scores between the Experimental and Control groups. An analysis of the mean scores indicates that the gain scores obtained by the Experimental group were not significantly greater than the Control group. The most likely explanation for this lies in the nature of the information required in Subtest 1. To review briefly, Score Orientation addressed the surface details obtained by a perusal of the score. These details include the name of the composer, the number of movements, tempi, key and meter, etc. It is possible that this information may be as easily assimilated by visually examining the surface details of the printed score and may not be enhanced by the use of the computer-assisted music instruction program. The program contains extensive biographical information which is not contained in the printed score, but this is not required to any degree in the test. Therefore, the Control group was able to gain the

required information to successfully complete Subtest 1 as well as the Experimental group. This necessitates the acceptance of the null hypothesis, and it is concluded that the experimental supplementary treatment had no significant effect over the traditional instruction.

Second Additional Research Hypothesis and Significance of Scores on Subtest 2

The differences in posttest scores experienced on Subtest 2 were also non-significant at the .10 level. The value obtained was p = .1609, which is higher than that which was displayed on the first subtest. Neither group achieved significant gains from pretest to posttest on this subtest, which addressed Score Reading. In this subtest, the student was asked to visually identify excerpts from the printed score by answering specific questions regarding each in a timed format. The information requested included the meter and key along with any changes that may be present, the voice containing the melody line, and so forth. Results indicate that a more in-depth visual examination of the score may be as easily accomplished by traditional methods as with the computer-assisted music instruction program.

It is also possible that the information requested is specific but may be gained by non-specific means. For example, Score Reading is addressed in Session Three of the computer-assisted music instruction program. The primary task is for the student to attempt to audiate the music on

the score through a visual reading. A variety of approaches are suggested, including solfege or the use of a piano keyboard to hear the music, but the emphasis and primary task for the student is to attempt to "hear" the music in his or her mind. The use of any external mechanism is discouraged until a sincere attempt is made to imagine the sounds contained in the score. When a point is reached that the student feels familiar with the entire work, it is suggested that he or she then utilize the audio CD and listen to the recording as he or she follows the score. He or she may pause or stop the CD at any time in order to examine the score more closely and may repeat any or all of this process as many times as necessary in order to become comfortable with the work.

As stated above, it is possible that this is too non-specific a task to be effective. Perhaps the student is allowed too much freedom and does not fully attempt to follow the instructions to the letter, but rather merely listens to the audio compact disk recording of the work and moves on in order to complete the sessions. Unless the instructions are specifically followed, the student will not develop the familiarity necessary to fully recognize each excerpt and answer the questions successfully.

It is also important to note that the pretest scores on Subtest 2 were the highest of the three. The mean pretest scores on this subtest were approximately twice that of the other two subtests. This indicates that the students were

able to achieve a good deal of success before actually studying the work and already had a grasp of the information at the time of the pretest. This could be attributed to having experienced the work in a performance situation prior to the investigation. It is also possible that they were simply able to view the excerpts and answer the questions with some degree of accuracy based on their musicianship skills alone. However, it has already been noted that there were non-significant gains experienced by either group from the pretest to the posttest, resulting in the acceptance of the null hypothesis in this case as well.

Third Additional Research Hypothesis and Significance of Scores on Subtest 3

The third subtest addressed the area of Score Analysis, which was divided into three phases in the computer-assisted music instruction program. The first phase involves a thematic analysis, with separate buttons and a brief description for each musical event. The student is taken through the work in this fashion in one session, developing familiarity with each event and the accompanying sound recording. The second phase presents a phrase analysis, in which the student is asked to observe the phrase groupings included with the computer score. Phase Three displays a screen for each movement that contains buttons corresponding to the separate musical event names experienced in Phase One. The student is asked to select events at random, anticipating

the audio playback in an attempt to recall the sound of the event before playback, thereby testing his or her individual recall of the specific musical events.

This particular subtest did display significant gains in scores by the Experimental group over those of the Control group. This indicates that the computer-assisted music instruction program is most effective in this area. This could be due to the fact that three complete sessions were devoted to this section. However, as noted above, two items on this subtest indicated little variance and therefore added almost no information to the measure. In addition, the knowledge required for successful performance on the third subtest is enhanced by the knowledge and familiarity gained during the study of the first two sections in addition to that which is gained in the third. Also, the third section contains three phases, each of which contribute to the overall knowledge of the work and reinforce the previous sections. Perhaps most importantly, the type and level of knowledge required in the third section is that which is least likely to be present at the time of the pretest. Therefore, this section would tend to display the greatest improvement as evidenced by the gains in test scores for the corresponding subtest. In this instance, the null hypothesis is rejected and the research hypothesis is accepted.

Discussion of Time Spent on and Attitudes Toward the CAMI Program by the Experimental Group

Students in the Experimental group were asked to undergo six sessions on the computer-assisted music instruction program over a period of three weeks, devoting one hour to each session. This was a result of findings obtained in the pilot study, where students indicated that the recommended period of 30 minutes per session was insufficient time to assimilate the required information. Therefore, the recommended time for each session was increased for the actual study. The students were asked to keep a record of their time on log sheets provided with the instructions.

Of the 22 students in the Experimental group, 19 completed and returned their log sheets with the results. It was found that the average time spent on each session was 27 minutes. Many students also chose to do more than two sessions per week; some more than two per day. This indicates that students in the group may not have devoted the necessary time to a given session to be able to assimilate all of the required information. There may be some correlation between this factor and the scores on the posttest. This possibility should be investigated further. A table displaying this information may be found in Appendix J. A copy of the Student Log may be found in Appendix D.

A Likert scale was used to determine the attitudes toward the CAMI program of the students in the Experimental group. Four responses were possible; Strongly Agree, Agree,

Disagree, and Strongly Disagree. A total of nine questions were asked regarding the use of the program and the accompanying test instrument. Of the 22 students in the group, 14 responded to the attitude questionnaire. In compiling the responses, the following point system was used: Strongly Agree = 4, Agree = 3; Disagree = 2; Strongly Disagree = 1. The points were totaled and averaged in order to obtain an indication of the student's attitudes toward the program. A copy of the questionnaire may be found in Appendix G.

On each of the nine questions, students responded positively in the Agree or Strongly Agree level. The lowest average score obtained (2.8) occurred on a question regarding the researcher-developed test. Although still in the Agree point range, there was obviously some concern that the test was not as adequate a measure of knowledge as desired. This substantiates the need for further investigation regarding test development.

Summary

As presented in Chapter 4, this investigation resulted in non-significant differences between the posttest scores of the experimental and control groups on Subtests 1 and 2, and significant differences in scores on Subtest 3 and the total measure. There are many possible explanations for this, as indicated above. Additional investigation is needed in order to fully answer these questions.

In summary, a computer-assisted music instruction program appears to be an effective supplement to regular classroom instruction for undergraduate wind band conducting students. Gains were made by both the control and experimental groups from pretest to posttest on the researcher-developed test. However, the experimental group displayed significantly higher gains at the .10 level from pretest to posttest on the researcher-developed test than the control group. This would indicate that a computer-assisted music instruction program designed for the purpose of supplementing traditional classroom instruction in the area of score study is an effective supplement, and that student learning is enhanced through the use of such a program.

The results of this investigation suggest that effective score study and subsequently, familiarity and knowledge of a specific work, can be improved under both the conditions of traditional classroom instruction and through the use of a computer-assisted music instruction program as a supplement to instruction. The fact that greater gains were made by the group using the computer-assisted music instruction program as a supplement to regular classroom instruction suggests that this is an effective means of enhancing the effects of traditional instruction.

The supplemental use of the computer-assisted music instruction program appears to have been particularly effective in improving knowledge of the model work over the exclusive use of traditional instructional methods in the

area of Score Analysis. This suggests that study in this area may be enhanced by the use of computer-assisted music instruction. It is likely that the type of information contained in sections one and two is as easily assimilated by traditional methods. While the computer-assisted music instruction program is effective in these areas, it is no more effective than traditional instructional methods.

Conclusions

Under the parameters and limitations of the present study, the following conclusions are made regarding the specific primary and additional hypotheses under consideration.

Students who used the computer-assisted music instruction program designed to supplement traditional instruction in the area of score study experienced a greater improvement in their knowledge of the overall work than those students who experienced only the traditional method of classroom instruction. This indicates that the computer may be used effectively in more advanced tasks such as score study, given the appropriate software application. Therefore, it is concluded that the computer is an effective tool for this type of instruction, allowing students to develop and emphasize score study skills as a supplement to regular classroom instruction.

In the additional hypotheses, the use of the computer-assisted music instruction program in the area of Score

Orientation proved to be effective, but not significantly more so than the traditional instruction. This suggests that traditional methods are sufficient in this area, but that the computer may be used as well. The same is true for the second area, Score Reading. While the results of this section indicate that the computer-assisted music instruction program was an effective tool, the traditional method of instruction was as effective. In the area of Score Analysis, results indicate that the computer-assisted music instruction program is a valuable tool for supplementing instruction, as evidenced by the significance of the gain scores experienced by the experimental group over those of the control group. This suggests that the computer is an effective tool in analytical tasks as well as drill and practice situations.

It is concluded, therefore, that the computer-assisted music instruction program is an effective supplement to traditional classroom instruction in the area of score study as evidenced by the posttest scores, particularly in the area of Score Analysis and on the total measure. The statistically significant difference in total posttest scores between the experimental and control groups indicate that this is a viable means to assist students in learning a method of score study.

Recommendations for Further Research

It is believed that the present study is the first to utilize a computer-assisted music instruction program as an

aid to score study. This method of supplementing instruction at the undergraduate level appears to be feasible and effective in developing knowledge and familiarity with a specific work from the wind band repertoire. However, further research is needed in this area and in related areas. Recommendations for further research are.

1. Further investigation is needed in order to ascertain whether the three-step process used in the present study is one that may be generalized to other wind band scores as well as to scores of other musical mediums (e.g. orchestral, choral).

2. A study should be conducted with a third experimental group, one that receives only the computer-assisted music instruction program as the method of learning score study, in order to fully ascertain its effectiveness as a teaching tool. In addition, another investigation is needed using a true control group that receives no treatment in order to ascertain whether the pretest has any effect on the posttest scores and also to determine the full effectiveness of the program.

3. Varying schedules of treatment should be investigated to determine the nominal time period for a student to experience a computer-assisted instructiou program designed as an aid to score study for a specific work. The amount of contact time utilized in the present study should undergo further review and revision in order to determine the optimal usage of the program in each of the subsections as well as the overall time devoted to its use. In addition, the amount of time spent using the computer-assisted music instruction program by the Experimental group should be factored into the statistical analysis. This would serve to determine any correlation between success on the researcher-developed test and time spent in the experimental treatment.

4. The computer-assisted music instruction program should be refined and revised further to allow for more branching and freedom for the student, while still maintaining the level of guidance necessary for undergraduate students to develop a knowledge of an effective method of score study.

5. The present researcher-developed test requires further revision, particularly in the area of reliability, since some items proved to be ineffective indicators of differences in levels of knowledge between individuals and between groups. It is possible that increased contact time or revisions to the computer-assisted music instruction program may have an effect on these non-contributing items. The reasons and solutions for this problem require additional investigation.

6. Qualitative research is needed in the area of score study to determine the need for standardization and the most efficient method(s) of instruction. This may also include recommendations concerning the degree of emphasis for undergraduate students in this area.

7. Quantitative investigation is needed in the form of a survey for undergraduate instructors of wind band conducting in order to determine the state of curricula and the present degree of emphasis and methods of teaching score study.

8. As technological advances become more available and less time consuming to master, the use of computer-assisted music instruction to supplement classroom instruction in more advanced tasks such as score study should be explored further. In addition, the use of custom-designed software applications tailored to meet the needs of a specific individual or class should be fully investigated.

9. Further investigation and development is needed in the area of effective evaluation of the results of score study. There is no standard test format at this time which will effectively test the knowledge of a specific work. Additional investigation is also needed in the area of demonstrating this knowledge, whether in the rehearsal situation or in an exam format.

10. Additional investigation is needed, perhaps in the form of evaluating video taped rehearsal situations, to determine the correlation between effective score study and success in the ensemble rehearsal. This would serve to integrate the fourth step of the score study process in which the student develops an interpretation of the work under study.

11. As advances in technology become more user-friendly as well as cost-effective, investigation is needed into the use of additional enhancements to a

computer-assisted music instruction program. These may include the following:

(a) The use of a videodisc player whereby the student may view a model of the appropriate conducting gestures as the piece is heard. The student may also be able to freeze the video and audio portions of the performance at any moment in order to view and study specific gestures.

(b) The use of computer-generated "virtual reality", in which the student may conduct along with a recording, the computer constantly comparing the students' gestures with an appropriate model and providing feedback, either during or following the exercise. This may be carried even further in which the student actually "sees" an ensemble, and conducts interactively with the group, the computerized ensemble responding to the gestures based on an appropriate model. The parameters of such a program could be adjusted to suit the needs and ability levels of the students.

It is recommended that, following necessary revisions and further development of the measurement instrument as well as the computer-assisted music instruction program, a four-group design be investigated in order to fully determine the effectiveness of the program. This study would include a true control group receiving no treatment, a true experimental group receiving only the computer-assisted music instruction program, a traditional group receiving the classroom instruction only, and a group receiving the computer-assisted music instruction program as a supplement to traditional classroom instruction. This would serve to indicate the optimal approach for undergraduate wind band conducting students as they learn to study scores

APPENDIX A
RAW POSTTEST SCORES

The following tables contain the raw scores for all participants in the study. They are presented in the following order:

Table

13 Raw Posttest Scores – Subtest 1

14 Raw Posttest Scores – Subtest 2

15. Raw Posttest Scores – Subtest 3

16 Individual Pretest, Posttest, and Total Scores

Table 13: Raw Posttest Scores for Subtest 1 - Score Orientation

ID	1	2	3	4	5	6	7	8	9	10	11	12	13
AC1C	1.00	0.00	0.00	0.00	1.00	0.16	1.00	0.31	1.00	0.00	0.00	0.00	0.25	0.50
AC2C	1.00	1.00	1.00	1.00	1.00	0.11	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AC1C	1.00	0.00	0.00	1.00	0.50	0.33	0.00	0.33	0.00	0.00	0.00	1.00	0.00	0.00
AC1M	1.00	0.00	1.00	1.00	0.10	0.33	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
AC2M	1.00	1.00	1.00	1.00	0.33	0.33	0.00	1.00	0.00	0.00	0.00	0.75	0.50
AC3M	1.00	0.00	0.00	1.00	0.16	0.50	0.00	0.00	0.00	0.00	0.00	0.75	0.00
MS1C	1.00	1.00	1.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00	1.00	0.25	1.00
MS2C	1.00	1.00	1.00	0.00	0.50	0.11	0.00	0.00	0.00	0.00	1.00	0.50	0.50
MS3C	1.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	1.00	0.25	0.50
MS4C	1.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.50	0.00
MS5C	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00
MS6C	1.00	0.00	0.00	1.00	0.33	0.00	0.00	0.66	0.00	0.00	0.00	0.25	0.00
MS7C	1.00	0.00	1.00	1.00	0.66	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.50
MS8C	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50
MS1E	1.00	1.00	1.00	0.00	0.00	0.33	0.00	0.11	0.00	0.00	0.00	0.00	0.00
MS2E	1.00	1.00	1.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.25	0.00
MS3E	1.00	1.00	1.00	0.00	0.33	0.33	0.00	0.33	0.00	0.00	1.00	0.50	0.50
MS4E	1.00	1.00	1.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.25	0.50
MS5E	1.00	0.00	0.00	0.00	1.00	0.33	0.00	0.33	0.00	0.00	0.00	0.25	0.00
MS4E	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00
MS7E	1.00	0.00	0.00	1.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.35	0.00
MS8E	1.00	1.00	1.00	1.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.50	0.50
WK1C	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WK2C	1.00	1.00	1.00	1.00	0.10	0.33	0.00	0.33	0.00	0.00	0.00	0.25	0.50
WK3C	1.00	1.00	1.00	1.00	0.66	0.00	0.00	1.00	0.00	0.00	0.00	0.25	0.50
WK4C	1.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.50	0.00
WK5C	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
WK6C	1.00	0.00	0.00	1.00	0.50	1.00	0.00	1.00	0.00	0.00	0.00	0.25	0.50
WK1E	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.50
WK2E	1.00	0.00	0.00	1.00	0.10	1.00	0.00	0.00	0.00	0.00	1.00	0.75	0.50
WK3E	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50
WK4E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00
WK5E	1.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	1.00	0.25	0.00
WK6E	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00
UF1C	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00
UF3C	1.00	0.00	0.00	0.00	0.00	0.66	0.00	0.00	0.00	0.00	1.00	0.50	0.50
UF5C	1.00	0.00	0.00	1.00	0.16	0.33	0.00	0.00	0.00	0.00	1.00	0.00	0.50
UF4C	1.00	1.00	1.00	1.00	0.33	0.33	0.00	0.31	0.00	0.00	0.00	0.75	0.00
UF5C	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50
UF1E	1.00	1.00	1.00	1.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.50	0.50
UF2E	1.00	1.00	1.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.50	0.50
UF3E	1.00	0.00	0.00	1.00	0.00	1.00	0.00	0.13	0.00	0.00	0.00	0.75	0.50
UF4E	1.00	1.00	1.00	0.00	0.16	0.00	0.00	0.50	0.00	0.00	0.00	1.00	0.00
UF5E	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00

Table 14: Raw Posttest Scores for Subtest 2 - Score Reading

ID	1-40 41-80
AC1C	1000000011101010111001011000100011001110 0101111011100110111001101111111111111111
AC2C	1001100011000010110001010100000000000101 0001111001110111101100111011001111111101101
AC3C	1000110011010101100001000100100110111010 0011101100110011001101111111111111111101
AC1R	1100100011111101111111101100011001100111 0100110011111101110111111001111110111111
AC2R	1111111011101000000010111001100000000000 0000100001101110000111111101100100011111
AC3R	1101110011001100000010110111001100010011
MS1C	1001100000001010110010101100000000000001 1010110011001110110111117011011101111111
MS2E	1111111011111100111011001110100111101111
MS3C	1101101111011001111000111001111011111101 0100111001101111011011111111111111111101
MS4C	1110101011111001101001011110111101111110 0111101100111011101111011111011111101
MS5C	1000110111011011100101111011111111111101 0101111110110011211011111011101111111
MS6C	1101110011111001111091011001110111101101
MS7C	1100110101101101111010001011110100011111 0101011001110111101111100110111011110
MS8C	1101100001010100110101101011111111011111 1111110110110011101111011111111111111
MS1E	1101100010101010111001101101101101011101 0100111001110111101101111011101111101
MS2E	1100000010001000111001101101001000100110 0101101110111011101101101111011111101
MS3E	1101110001010101101010110111011101110000 0011111011111110101111011111111111110
MS4E	1101101111010111111101010111001111010101 1111110011101101010111101111111111111
MS5E	1100110011010100111010111011101111111111
MS6E	1101111001100111011011111001111111111111 1100110011001111001111111111111111111
MS7E	1101101101100000011001001101111111111111 1101111011011101111011011001111111101
MS8E	1000101011111101111101010110110111011011110 1101111011101100100011111011111111111

Table 14.1 Raw Posttest Scores for Subtest 2 - Score Reading, part 2

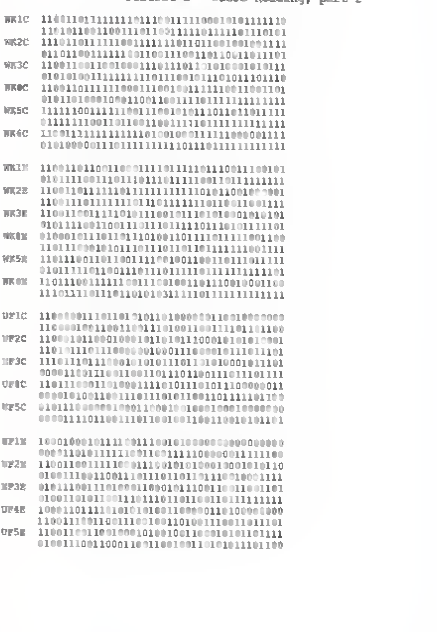


Table 15: Raw Scores for Subtest 3 - Score Analysis

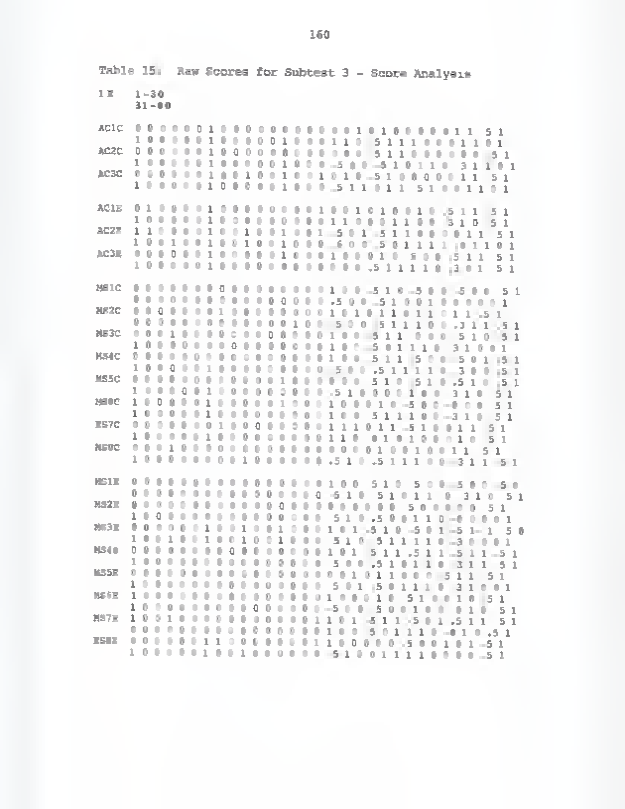


Table 15. Raw Scores for Subtest 3 - Score Analysis, part 2

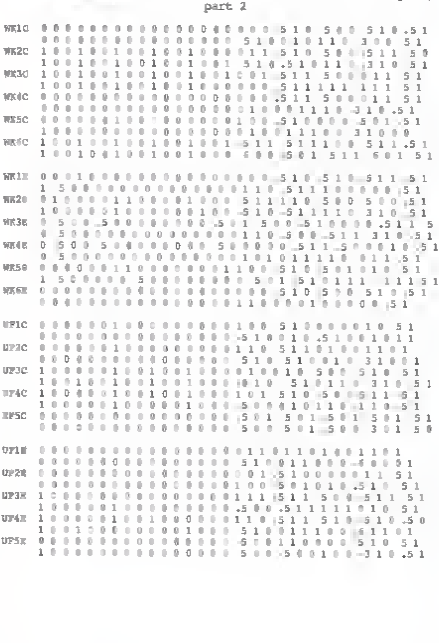


Table 16. Individual Pretest, Posttest, Total Scores

id	grp	pretest	pre1	pre2	pre3	posttst	post1	post2	post3
AC1	C	41	40	52	30	46	44	60	33
AC3	C	36	36	47	25	36	29	60	26
AC3	C	41	32	54	37	45	32	70	34
MS1	C	35	42	46	15	53	61	56	39
Ms2	C	40	45	67	32	65	67	01	32
MS3	C	30	24	65	25	46	48	65	34
MM4	C	36	12	70	26	46	36	67	36
MS5	C	35	15	71	24	49	47	64	37
MS6	C	41	20	66	26	53	51	65	40
MM7	C	47	42	64	34	54	52	71	40
MS0	C	61	00	66	26	53	53	65	46
WK1	C	33	00	69	16	27	00	55	18
WK2	C	51	45	66	42	58	56	56	36
WK3	C	54	54	61	46	51	50	61	41
WK4	C	33	14	60	22	33	19	51	30
WK5	C	40	33	75	21	35	30	46	20
WK6	C	53	46	71	40	56	50	69	40
UF1	C	21	25	45	22	40	61	59	23
UF2	C	34	20	49	26	51	64	49	36
UF3	C	46	40	61	37	55	66	65	36
UF4	C	45	44	55	35	46	53	55	30
UF5	C	24	15	46	10	60	71	65	44
AC4	E	46	40	62	31	56	59	70	47
AC5	E	46	53	46	44	56	54	62	52
AC6	E	30	38	55	30	46	55	60	33
MS6	E	37	36	62	20	54	52	66	43
MS16	E	31	47	52	14	40	47	69	29
MS11	E	53	54	66	36	63	70	74	46
MS12	E	46	31	75	33	60	75	06	44
MS13	E	30	20	66	35	47	45	60	36
MS14	E	33	17	62	20	40	31	61	32
MS15	E	40	24	61	34	63	72	70	44
MS16	E	40	44	76	36	55	61	66	35
WK7	E	45	40	69	27	56	60	72	27
WK8	E	50	42	71	30	53	46	75	39
WK9	E	37	19	64	20	46	56	55	26
WK10	E	33	02	65	26	57	53	74	45
WK11	E	43	23	74	34	46	56	46	38
WK12	E	37	25	70	16	41	36	59	35
UF6	E	35	41	43	23	40	50	46	37
UF7	E	36	33	55	21	50	36	67	43
UF8	E	44	35	60	36	52	65	56	35
UF9	E	41	37	46	37	57	61	62	44
UF10	E	29	16	50	19	40	26	59	31

APPENDIX B
HYPERCARD STACK PRINTOUTS

The following pages contain printouts for each Hypercard stack in the computer-assisted music instruction program. All stacks that are interactive with the user are represented. They are presented in the following order:

1. Home (complete, 2 cards)
2. Instructions (complete, 10 cards)
3. Biography (sample, 2 cards)
4. Score (sample, 3 cards)
5. Compositions (sample, 1 card)
6. Analysis (sample, 3 cards)
7. Play (complete, 4 cards)
8. References (sample, 1 card)
9. Glossary (sample, 1 card)

Home stack, complete 2 cards)

Welcome to a study of the First Suite in E-Flat for Military Band by Gustav Holst. This program is designed to systematically guide you through a study of this important work for the wind-band medium. You may refer to the instructions at any time during a session by clicking on the question mark button Use the right arrows to move forward ⇨ and the left arrows to go back. ⇦
You may also return to the main index at any time by clicking the index button. (index)

Please read all instructions for each session of the program before beginning that session. Also, please follow the instructions given, particularly in reference to the order of progression through the program. Thank you for participating in this study.

(Please click the right arrow button to proceed.)

(index) ⇨

SCORE STUDY

In a review of texts on the subject of conducting, it is possible to arrive at a method of score study that allows the student to progressively and systematically explore and become acquainted with a musical work. This process may be stated in three steps as expressed in Guide to Score Study.

STEP ONE - SCORE ORIENTATION

STEP TWO - SCORE READING

STEP THREE - SCORE ANALYSIS

You will use this process as you discover this composition. It is also recommended that you apply this method of score study in future works that you prepare to conduct. As you move through this program, you will have some freedom to review and explore on your own. However, please follow the instructions as closely as possible in order to keep this study valid. All the information you will need is contained in this program. However, if you wish to further research Gustav Holst or his works, please see the **References** stack.

⇦ (index) ⇨

Instructions stack (complete, 19 cards)

SESSIONS

You will experience six sessions in all. Each should be performed in order, individually, in its entirety and without assistance. Use the buttons below to take you to each session, beginning with the appropriate instructions. You may refer to the instructions at any time during a session by clicking the 'Help' button. Please read the instructions carefully and follow them closely. The use of a full score is optional.

Please select the appropriate session to continue

Session 1 - Introduction

Session 2 - Score Orientation

Session 3 - Score Reading

Session 4 - Score Analysis, Phase One

Session 5 - Score Analysis, Phase Two

Session 6 - Score Analysis, Phase Three

⇦ Index

INTRODUCTION TO GUSTAV HOLST

As you begin this study, it is appropriate to first familiarize yourself with the composer's life and works. The button marked 'Biography' below will take you to the stack with this information. As you read through this stack, remember that you may click on the name of a work that is underlined for more information on that work. It is suggested that you utilize this feature. As you then move to the 'Compositions' stack, you may read the information on the specific work and then return to the card you left by clicking on the 'return to bio' button at the bottom of the card. It is necessary to read through the 'Biography' stack only once, but pay particular attention to the works for wind band by Holst as an important body of works for this medium. You may use the 'Help' button to return to this card at any time during the use of the stack, if you feel the need.

Index Biography

Instructions stack (complete 10 cards)

INSTRUCTIONS FOR STEP ONE -- SCORE ORIENTATION

The button below will take you to the "Score" stack, where you will find the condensed score to the Holst First Suite. (Use of a full score is optional.) Use the right arrow buttons to move through the score at a leisurely pace. **You may click on a musical term for the definition of that term.** During this step you will need to **observe all surface** information contained in the score. This will include the following elements:

- Title and year of composition
- Name and dates of composer
- Number and titles of movements
- Length of each movement and total length of the work
- Key signatures and changes
- Time signatures and changes
- Tempo markings and changes
- Any and all unfamiliar musical terms, including titles

(you may click on a musical term for the definition; the program will return to the card you left automatically)

Do not attempt to read the musical elements of the score during this first step. Instead, concentrate on remembering the elements listed above.

Index | Score

INSTRUCTIONS FOR STEP TWO -- SCORE READING

After you have completed Step One (Score Orientation), you are ready to proceed to Step Two - Score Reading. The button marked 'SCORE' below will return you to that stack, where you will now read the score and listen as it is played on the CD. Be sure the audio CD (Telarc CD-80038, Frederick Fennell and the Cleveland Symphonic Winds) is loaded into the CD caddy and properly inserted into the computer. Then, click through the computer score at a comfortable pace, attempting to read the notation and hear the music in your mind. You may wish to use solfege or a neutral vowel to sing the lines aloud, and also vocalize each chord from bottom to top. You may play each line on a keyboard, if one is available, but please do this only after attempting to hear the music and sing it without any external assistance. After you have completed this process as many times as necessary to feel relatively comfortable with the music, use the

button marked PLAY to hear the score Follow the music through the score by clicking on the right arrow button to proceed to the next page Use the "STOP" button to stop the audio and return the CD to the beginning Use the PAUSE button to pause the CD and again to continue Continue in this manner until you have listened to the entire work Compare the actual sound to the mental image you developed previously You may also wish to refer to the full score

This process may be attempted with the entire work with each movement separately or even with each individual page of the computer score Please do what seems best for you but make a real effort to improve your ability to hear the music in your mind as you progress Use the audio CD to check and verify your mental image and to clarify sections which prove difficult for you to imagine Perform this step as many times as you feel necessary to become familiar with the entire work

(Score Reading - card 2 of 2)

Index | Go to "Score"

Instructions for

Step Three – Score Analysis

Now that you have become familiar with the First Suite, it is now time to begin discovering the various elements that comprise this work In this section you will find and study the principal themes of each movement and how they are used, the breakdown of phrases within each movement, and become familiar with the instrumentation used by Holst. You will again be using the "Score" portion of the program, as well as the section entitled "Analysis". Finally, you will use the 'Play' section to test your knowledge and familiarity with the work. Again, you may use the full score for reference.

Phase One of this step will utilize the **Analysis** stack As you enter this section of the program you will notice a portion of the score accompanied by a description of the musical event Each event has a button that allows you to hear the excerpt as you read the text As you read and listen concentrate on the event as an excerpt and as part of the entire movement based on your familiarity with the work Go through the entire stack in one session repeating each event as many times as necessary

Index | Go to "Analysis"

Instructions stack (complete 18 cards)

Instructions for

Step Three – Score Analysis

Phase Two

Phase Two of the Score Analysis involves becoming familiar with the phrase structure of the work. As a conductor it is important to know each individual phrase, as this controls the flow of the work and is the basis for the overall architecture. Also this will aid you in conducting the work before an ensemble both in rehearsal and in performance.

For this phase return to the "Score" stack and observe the numerical designations below the staff. These indicate various numbers of measures combined to form phrases and periods. As you first observe and then listen concentrate on the length of each phrase and listen to the shape or contour of each. Use the "Pause" button to interrupt the audio playback in order to study each phrase before listening. Attempt to "hear" the musical passage in your mind before adding the actual sound. Consider each phrase in terms of its contour and shape and as a complete musical thought. As before, the use of a full score is optional.

Index | Go to "Score"

Instructions for

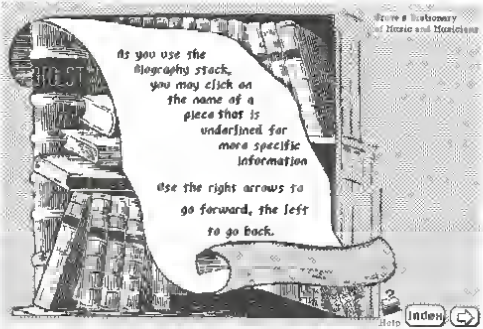
Step Three – Score Analysis

Phase Three

Phase Three of the Score Analysis step involves testing your knowledge of the work under study. Use the button below to take you to the "Play" stack. You will see buttons listing the three movements of the First Suite. Make your choice of the movement you wish to examine and press the corresponding button. You will then see a listing of each major musical event of that movement along with a representation of a CD controller. First try to recall the sound of a particular event in your mind, then click on that event to test your memory. The CD will respond by playing only that event and then stop and await your next choice. If you need to pause the audio or otherwise manipulate the playback, use the buttons on the controller to the right of the screen. You may wish to first test yourself on each event in their proper order, then choose events at random to further challenge your memory. There is a separate screen for each movement, and you may select a different movement by using the "Reselect" button.

Index | Go to "Play"

Biography stack (sample 2 cards)



Holst, about 11 years old

Gustavus Theodore von Holst was born on September 21, 1874 in Cheltenham, England to an artistic family. His great-grandfather Matthias was a pianist and composer, his grandfather Gustavus a pianist and teacher, his granduncle Theodor a painter. His father Adolphus was a pianist and organist, and also taught privately. Adolphus was well known in Cheltenham as an exceptional pianist, teacher, conductor, and organist of All Saint's Church. He also gave regular recitals and directed chamber orchestra concerts. Adolphus married one of his students, Clara Lediard, who was the mother of Gustav. His younger brother Emil was an actor. Holst's mother died when he was eight, and his father later married another of his pupils, Mary Stone.

First Suite in Eb Opus 28a

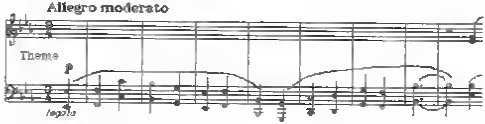
Total Performance Time 10 14

1 Chaconne 4 37 ○ 2 Intermezzo 2 48 ○ 3 March 2 49

Boosey & Hawkes
Publisher

Composed by
GUSTAV HOLST

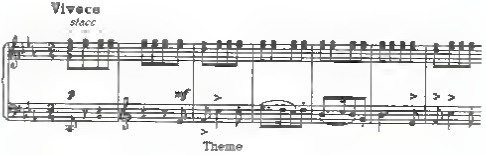
I. Chaconne



Phrase [4 + 4]

Index Session 2 Help Session 3 Help Session 5 Help Play Stop ○ Pause

II. Intermezzo



[2 + 4 + 4

Index Session 2 Help Session 3 Help Session 5 Help Play Stop ○ Pause

"Score" stack (example 3 entries)

III. March

Index Session 2 Help Session 3 Help Session 5 Help Play Stop Pause

Compositions - stack (example 1 card)

First Suite in E-Flat (all descriptions from Band Music Notes except where noted)

British composers have produced several exceptionally fine works for the concert band. Of all these, the Suite in E-Flat is generally regarded as the cornerstone. Written in 1909 it is one of the few band originals that has been transcribed for symphony orchestra.

The opening theme of the Chaconne is repeated incessantly by various instruments as others weave varied filigrees about the ground theme. In the middle of the first movement the principal theme is inverted for several repetitions. The Intermezzo is based on a variation of the Chaconne theme, presented first in an agitated style, then in a cantabile mood, the two styles alternating throughout the movement. The two themes of the March, one dynamic and the other lyric, are also taken from the Chaconne theme: the first being something of an inversion, whereas the lyric theme is "right side up" Eventually the two are combined in a thrilling counterpoint leading to the coda.

(Pub: Boosey & Hawkes: Grade 4: Time = 10:00)

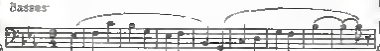
return to bio

Index

(Analyzes according to Charles Gallagher Journal of Band Research)

Chaconne

The Chaconne is the first movement of the Suite and is essentially a theme and fifteen variations. The theme is an eight bar ground bass announced in the Euphoniums and Basses:



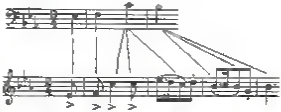
This theme is also the source of most of the significant melodic material out of which the second and third movements are constructed.

(Click this button on each card to hear the excerpt) ☞

Index

Intermezzo

The second movement is marked *Vivace* and is in ternary form with an extended coda. The theme of this movement is taken directly from the first four notes of the Chaconne.



Index

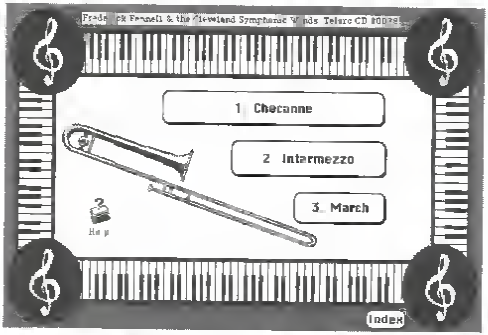
Analysis' stack (example 3 cards)

March

The third movement begins with a bold four-bar introduction consisting of the same first three notes of the Chaconne but stated in inversion and descending sequentially through the brasses under a woodwind trill

Index

Play stack animate 4 cards



Chaconne

Theme

Variation 1
Variation 2
Variation 3
Variation 4
Variation 5
Variation 6
Variation 7
Variation 8
Variation 9
Variation 10
Variation 11
Variation 12
Variation 13
Variation 14
Variation 15 (Coda)

help

Play stack (complete 4 cards)

Intermezzo

Part One

Theme

Bridge

Repeat

Part Two

First Theme

Second Theme

Repeat

Part Three

Three Themes

Coda

Help

March

Introduction

Part One

A Theme

B Theme

A Return

Part Two

Introduction/Trio Theme

Development

Transition

A/B Return

Part Three

Parts 1 and 2

Coda

Help

References stack (sample 1 card)

Reference works used in this program:

(see next card for supplemental reference list)

1 Thematic Derivations in the Holst First Suite in E Flat
Charles Gallagher Journal of Band Research

2 Grove s Dictionary of Music and Musicians

3 Suite No 1 in E Flat for Military Band
Condensed score - Boosey & Hawkes, Publisher

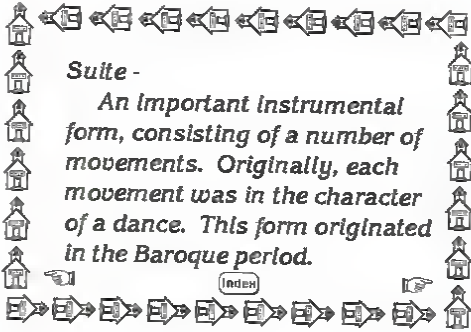
4 Band Music Notes
Norman Smith and Albert Stoutamire

5 Music Theory Dictionary
William F Lee

6 Harvard Dictionary of Music
Willi Apel

Index ➪

Glossary stack (example 1 card)


Suite -
An important instrumental form, consisting of a number of movements. Originally, each movement was in the character of a dance. This form originated in the Baroque period.
Index

APPENDIX C
STATUS OF CONDUCTING TEXTS

(List according to Books in Print)

A = Available

OP = Out of Print

NI = No Information

Ary, D., Jacobs, L. C., & Razavieh, A. (1985). Introduction to research in education (3rd ed.). Orlando, Florida: Holt, Rinehart, & Winston, Inc. (OP, 4th & 5th ed. available)

Bakaleinikoff, V. (1938). Elementary rules of conducting. New York: Belwin, Inc. (NI)

Bamberger, C. (1965) The conductor's art. New York: Belwin, Inc. (IP)

Battisti, F. & Garofalo, R. (1990) Guide to score study for the wind band conductor. Ft. Lauderdale: Meredith Music Publications (IP)

Berg, D. E. (1927) Early and classical symphonies and the function of a conductor. New York: The Caxton Institute, Inc. (NI)

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Mancini, H.

APPENDIX D
STUDENT INSTRUCTIONS FOR USE OF THE COMPUTER-ASSISTED MUSIC INSTRUCTION PROGRAM, INCLUDING SAMPLE STUDENT LOG

STUDENT INSTRUCTIONS - COMPUTER PROGRAM

Thank you for participating in this study. The following instructions will get you into the program. There is sufficient on-line help to assist you from there. Please observe the following guidelines:

1. Always follow the prescribed procedures and progression for each session. Please view and use only the portion of the program that is assigned by these instructions for each session.
2. Always log your sessions on the Student Log.
3. Always work by yourself.
4. Always read all instruction pertaining to each session before beginning.
5. Please complete your six sessions in the three-week period (two sessions per week) and return all materials to your instructor.

I hope that you will benefit from this experience as you study a cornerstone of the wind band repertoire.

Session One - Introduction
You will need the Solst CD, the CD caddy, these instructions, headphones or speakers plugged into the CD-ROM drive, and writing materials (if you wish to take any notes) for each session. If you are unfamiliar with standard mouse operation, including point-and-click, please ask your lab monitor or administrator. A full score of the First Suite is recommended.

1. Turn the computer on and wait for the Finder screen to appear.
2. Place the CD into the caddy and insert the caddy into the CD-ROM drive.
3. Open the folder entitled "Solst 1 0" on the hard drive.
4. Double-click the "Home" icon.
5. When the introductory screen appears, read the information presented.
6. Click the right-arrow to move forward.
7. When the "Index" screen appears, click the button marked "Instructions".
8. When the "Sessions" screen appears, read the information and then click the button marked "Session 1".
9. After fully completing this session, go to the "File" menu and implement the "Quit" function. Close all windows and choose "Shut down" from the "Special" menu. The disks will eject, and you may then turn the computer off.

Session Two - Score Orientation
You will need the same materials as above.
Follow steps 1-7 above.
8. When the "Sessions" screen appears, click the button marked "Session 2".
9. At this point, the program is self-explanatory.
10. Complete the Quit and Shut down process as described above.

Student Instructions for use of the Computer-Assisted Music Instruction Program, Including Sample Student Log, part 2

Session Three - Score Reading
You will need the same materials as above.
Follow steps 1-7 above.
8. When the "Sessions" screen appears, click the button marked "Session 3"
9. At this point the program is self-explanatory.
10. Complete the Quit and Shut Down process as described above.

Session Four - Score Analysis, Phase 1
You will need the same materials as above.
Follow steps 1-7 above.
8. When the "Sessions" screen appears, click the button marked "Session 4"
9. At this point, the program is self-explanatory
10. Complete the Quit and Shut Down process as described above

Session Five - Score Analysis, Phase 2
You will need the same materials as above.
Follow steps 1-7 above
8. When the "Sessions" screen appears, click the button marked "Session 5"
9. At this point the program is self-explanatory
10. Complete the Quit and Shut Down process as described above

Session Six - Score Analysis, Phase 3
You will need the same materials as above.
Follow steps 1-7 above.
8. When the "Sessions" screen appears, click the button marked "Session 6"
9. At this point the program is self-explanatory.
10. After completing this session, please feel free to roam about the program, reviewing any portion you like.
11. Complete the Quit and Shut Down process as described above

Upon completion of your six sessions in the three-week period please return your student log sheet to your instructor. Be sure you have entered each of your six sessions. Again, thank you for participating in this study.

(Student Log)

INSTRUMENTAL CONDUCTING CLASS

STUDENT LOG - HOLST PROGRAM
(Please sign in and out for each session)

Student Name _____

Session Number	Date	Time In	Time Out
1			
2			
3			
4			
5			
6			

Please complete the attitude questionnaire on back following the completion of Session Six Thanks!

APPENDIX E

COPY OF THE RESEARCHER-DEVELOPED TEST ON THE HOLST FIRST SUITE IN E-FLAT, INCLUDING TEST ANSWER KEY

First Suite in E Flat for Military Band

Test

Name _____

Date _____

Institution _____

Classification _____

Instructor _____

PHASE ONE - SCORE ORIENTATION (QUESTION SHEET)

USE THE ANSWER SHEET TO ANSWER QUESTIONS
>>>>>>>>>>>>>

1. The First Suite in E Flat was composed by
(a) Ralph Vaughan Williams (b) Percy Grainger
(c) Gustav Holst

2. The composer's dates are
(a) 1874-1934 (b) 1835-1881 (c) 1912-1978 (d) 1854-1908

3. This work was composed in
(a) 1857 (b) 1909 (c) 1943 (d) 1871

4. The First Suite contains _____ movements
(a) two (b) three (c) four (d) five

5. Identify each movement's title and its corresponding definition

6. List the initial key of each movement.

7. List the initial tempo of each movement.

8. List the initial meter of each movement.

9. List the performance time for each movement:

10. The approximate total performance time is:

11. The definition of "Suite" is

12. Define the following musical terms:

a. Brillante b. Pesante
c. L'istesso tempo d. morendo

13. List two other original works for wind band by this composer.

USE THE ANSWER SHEET TO ANSWER QUESTIONS
>>>>>>>>>>>>>

ANSWER SHEET FOR PHASE ONE - SCORE ORIENTATION

1 _____ 2 _____ 3 _____ 4. _____

5

6

7

8

9.

10. _____

11 _____

12 a) _____ b) _____

c) _____ d) _____

13 1. _____

2. _____

TURN THE PAGE FOR PHASE TWO

>>

PHASE TWO - SCORE READING (QUESTION SHEET)

USE THE ANSWER SHEET TO ANSWER QUESTIONS
>>>>>>>>>>>>>

You have 45 seconds to examine each score excerpt and answer the following questions about each

1. What is the meter?
(a) 2/4 (b) 3/4 (c) 4/4 (d) 6/8
(e) 2/2 (f) unknown

2. What is the key?
(a) E flat (b) A flat (c) B flat (d) C minor
(e) C major

3. In what voice is the melody?
(a) Soprano (b) Alto (c) Tenor (d) Bass

4. What is the predominant texture?
(a) Monophonic (b) Polyphonic (c) Homophonic

5. What is the predominant dynamic level?
(a) piano (b) mezzo piano (c) mezzo forte
(d) forte (e) fortissimo (f) unknown

6. Is there a signature (meter or key) change?
(a) yes (b) no

7. The style is predominantly
(a) legato (b) marcato (c) staccato
(d) combination (e) none

8 The passage is
(a) thinly scored (b) thickly scored

USE THE ANSWER SHEET TO ANSWER QUESTIONS
>>>>>>>>>>>>>

ANSWER SHEET FOR PHASE TWO - SCORE MEANING

Excerpt 1:

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

7. _____ 8. _____

Excerpt 2:

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

7. _____ 8. _____

Excerpt 3:

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

7. _____ 8. _____

Excerpt 4:

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

7. _____ 8. _____

Excerpt 5:

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

7. _____ 8. _____

TURN THIS PAGE FOR EXCERPTS 6 - 10
>>

PHASE TWO - SCORE READING (QUESTION SHEET, p. 2)

USE THE ANSWER SHEET TO ANSWER QUESTIONS
>>>>>>>>>>>>>

1. What is the meter?
(a) 2/4 (b) 3/4 (c) 4/4 (d) 5/8
(e) 2/2 (f) unknown

2. What is the key?
(a) E flat (b) A flat (c) B flat (d) C minor
(e) C major

3 In what voice is the melody?
(a) Soprano (b) Alto (c) Tenor (d) Bass

4. What is the predominant texture?
(a) Monophonic (b) Polyphonic (c) Homophonic

5. What is the predominant dynamic level?
(a) piano (b) mezzo piano (c) mezzo forte
(d) forte (e) fortissimo (f) unknown

6. Is there a signature (meter or key) change?
(a) yes (b) no

7 The style is predominantly
(a) legato (b) marcato (c) staccato (d)
combination (e) none

8. The passage is
(a) thinly scored (b) thickly scored

USE THE ANSWER SHEET TO ANSWER QUESTIONS
>>>>>>>>>>>>>

SCORE READING ANSWER SHEET, PAGE TWO

Excerpt 6:

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

7. _____ 8. _____

Excerpt 7:

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

7. _____ 8. _____

Excerpt 8:

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

7. _____ 8. _____

Excerpt 9:

1. _____ 2 _____ 3 _____

4. _____ 5. _____ 6 _____

7 _____ 8. _____

Excerpt 10

1. _____ 2. _____ 3. _____

4 _____ 5 _____ 6. _____

7. _____ 8 _____

TURN THE PAGE FOR PEASE THERE
>>>

PHASE THREE - SCORE ANALYSIS (QUESTION SHEET, p. 2)

USE THE ANSWER SHEET TO ANSWER QUESTIONS
>>>>>>>>>>>>>>

Listen to the following audio excerpts. After each, answer the following questions. You will have approximately 30 seconds between excerpts.

1. In which movement does the excerpt belong?

2. What theme, variation, or other musical event describes the excerpt?

3. What is the outline of the phrase?

4. What is the approximate tempo?

5. What is the predominant instrument?

6. Is the excerpt predominantly in a major or minor mode?

USE THE ANSWER SHEET TO ANSWER QUESTIONS
>>>>>>>>>>>>>>

ANSWER SHEET FOR PHASE THREE - SCORE ANALYSIS

Excerpt 1:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Excerpt 2:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Excerpt 3:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Excerpt 4:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Excerpt 5:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

TURN THE PAGE FOR EXCERPTS 6 - 10
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

PHASE THREE - SCORE ANALYSIS (QUESTION SHEET, p. 2)

USE THE ANSWER SHEET TO ANSWER QUESTIONS
>>>>>>>>>>>>>

1. In which movement does the excerpt belong?

2. What theme, variation, or other musical event describes the excerpt?

3. What is the outline of the phrase?

4. What is the approximate tempo?

5. What is the predominant instrument?

6. Is the excerpt predominantly in a major or minor mode?

USE THE ANSWER SHEET TO ANSWER QUESTIONS
>>>>>>>>>>>>>

SCORE ANALYSIS ANSWER SHEET - PAGE TWO

Excerpt 6:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Excerpt 7:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Excerpt 8:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Excerpt 9:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Excerpt 10:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

END OF TEST

Test Key

Score Orientation

1. (c) 2. (a) 3. (b) 4. (b)

5. 1st mvt. - Chaconne: A kind of continuous variation in a moderately slow triple meter and with a slow harmonic rhythm, changing generally with the measure.
2nd mvt. - Intermezzo: A light musical interlude, originally between acts of a play.
3rd mvt. - March: A composition with strongly marked rhythm, suitable for accompanying troops in walking. Generally written in 2/4 or 6/8 meter.

6. Chaconne - Eb Intermezzo - Eb or C minor March - Eb

7. Chaconne - Allegro moderato
Intermezzo - Vivace
March - Tempo di marcia

8. Chaconne - 3/4 Intermezzo - 2/4 March - 2/2

9. Chaconne - 4:37 Intermezzo - 2:48 March - 2:49

10. 10:14

11. Suite - An important instrumental form, consisting of a number of movements. Originally, each movement was in the character of a dance. This form originated in the Baroque period.

12. Brillante - Brilliant, sparkling.
Pesante - Heavy, ponderous.
L istesso tempo - Same tempo.
Morendo - Fading away.

13. 1. Hammersmith
2. Second Suite in F

Key :: p. 2

Score Reading

Excerpt 1. Chocenne, varietice 3

1. (h) or (f) 2. (e) 3. (c) or (d) 4. (b)
5. (c) 6. (b) 7. (d) 8. (a)

Excerpt 2. Chocesse, varietice 5

1. (h) or (f) 2. (a) 3. (c) or (d) 4. (c)
5. (f) or (e) 6. (b) 7. (d) 8. (b)

Excerpt 3. Chocenne, varietice 1E

1. (b) or (f) 2. (a) or (d) 3. (a) or (h) 4. (c)
5. (f) or (a) 6. (h) 7. (e) 8. (b)

Excerpt 4. Ietersesse, These

1. (a) 2. (d) 3. (b) or (e) 4. (c)
5. (c) 6. (b) 7. (c) 8. (e)

Excerpt 5. Ietermexxe, Three Themse

1. (e) 2. (e) 3. (c) 4. (c)
5. (h) or (a) 6. (h) 7. (d) 8. (b)

Key - p. 3

Score Reading - p. 2

Excerpt 6. March, Trio Theme

1. (f) or (e) 2. (b) 3. (c) 4. (c)
5. (f) or (c) 6. (h) 7. (a) 8. (h)

Excerpt 7. March, Development

1. (f) or (e) 2. (h) 3. (a) 4. (c)
5. (e) 6. (h) 7. (e) or (c) 8. (h)

Excerpt 8. March, A & B Return

1. (f) or (e) 2. (e) 3. (e) or (a) 4. (b)
5. (e) 6. (b) 7. (h) 8. (b)

Excerpt 9. March, Parts 1 & 2

1. (f) or (e) 2. (a) 3. (a) or (c) 4. (b)
5. (f) or (e) 6. (h) 7. (h) 8. (b)

Excerpt 10. March, Coda

1. (f) or (e) 2. (e) 3. (e) or (c) 4. (c)
5. (e) 6. (b) 7. (b) 8. (h)

Key - p. 4

Score Analysis

Audio Excerpt 1. Intermezzo, Part 1, Theme

1. 2nd
2. Part 1, Theme
3. 2+4+4+4+4+4+2+2
4. vivace or 140-160
5. clarinet
6. minor

Audio Excerpt 2. March, Part 2, Introduction/Trio Theme

1. 3rd
2. Introduction/Trio Theme
3. 2+2+4+4+4+4+4+4+4+4+4+4+4+4+4+4
4. march or 120-140
5. euphonium/clarinet
6. major

Audio Excerpt 3. March, Introduction

1. 3rd
2. Introduction
3. 2+2
4. march or 120-140
5. clarinet/trumpet
6. minor

Audio Excerpt 4. Chaconne, Variation 13

1. 1st
2. Variation 13
3. 4+2+3
4. allegro moderato or 100-110
5. trumpet/horn
6. major

Audio Excerpt 5. March, Part 1, E Theme

1. 3rd
2. Part 1, E Theme
3. 4+4+2+2+2+2
4. march or 120-140
5. trumpet/trombone
6. major

Key - p 5

Score Analysis

Audio Excerpt 6. Intermezzo, Part 2, First Theme

1. 2nd
2. Part 2, First Theme
3. 1+4+4+4+3+1+4+4+4+3+2
4. vivace or 140-160
5. clarinet/trumpet
6. minor

Audio Excerpt 7. Chaccone, Variation 9

1. 1st
2. Variation 9
3. 4+4
4. allegro moderato or 100-110
5. clarinet/horn
6. minor

Audio Excerpt 8. March, Part 2, Transition

1. 3rd
2. Part Three, Transition
3. 4+4+2+2+4+4+2+2+2
4. march or 120-140
5. trumpet
6. major

Audio Excerpt 9. Intermezzo, Part 3, Three Themes

1. 2nd
2. Part 3, Three Themes
3. 1+2+2+2+2+2+2+2+1
4. vivace or 140-160
5. euphonium/clarinet/trumpet
6. major

Audio Excerpt 10. Chaconne, Variation 15 (Coda)

1. 1st
2. Variation 15 (Coda)
3. 4+2+3+1
4. allegro moderato or 80-100
5. trumpet/trombone
6. major

APPENDIX F
PARTICIPATING INSTRUCTOR INTERVIEW QUESTIONS

Instructor:
Please take a moment to complete the following questionnaire. The information will be used in relating this study to the curriculum design preferred by the instructor. Thank you very much.

Instructor _____ **Institution** _____

1. What conducting text(s) do you use in class, or do you create your own materials?

2. When during the semester do you normally address the topic of score study in class?

3. Approximately how many class meetings are devoted to this topic?

4. Please briefly outline your method of instruction in this area.

5. Do you assign a specific work for the wind band as a study score? If so, how long do they have to study the work?

6. Do you have your students follow a specific method or process of score study?

7. How do you test the students' knowledge of a specific work?

8. Do you use computer-assisted instruction to supplement your classroom instruction? If so, in what areas?

9. Please feel free to respond with suggestions on the computer program and/or its use.

APPENDIX G
EXPERIMENTAL GROUP ATTITUDE QUESTIONNAIRE

Attitude Questionnaire - Solat Study Participants

Please indicate your response to the questions below by circling the answer which best reflects your opinion

1. The Solat program in this study can be a useful tool for the undergraduate instrumental conducting student

a) Strongly agree b) Agree c) Disagree d) Strongly disagree

2. The program directions were easy to follow and complete

a) Strongly agree b) Agree c) Disagree d) Strongly disagree

3 The amount of contact time (six sessions) with the program was sufficient for me to develop a solid familiarity with the Suite

a) Strongly agree b) Agree c) Disagree d) Strongly disagree

4 The format and layout of the program was conducive to the goal of developing a familiarity with the Suite

a) Strongly agree b) Agree c) Disagree d) Strongly disagree

5. I feel that I am more comfortable with the process of studying a score through the use of this program

a) Strongly agree b) Agree c) Disagree d) Strongly disagree

6 I enjoyed using the program

a) Strongly agree b) Agree c) Disagree d) Strongly disagree

7 The test format was appropriate to the study

a) Strongly agree b) Agree c) Disagree d) Strongly disagree

8 The test was an adequate measurement of my level of knowledge about the Suite

a) Strongly agree b) Agree c) Disagree d) Strongly disagree

9 This type of technology should be an increasingly important supplement to classroom instruction in music in the future.

a) Strongly agree b) Agree c) Disagree d) Strongly disagree

10 Please use the back of this form to provide any suggestions you may have regarding the program and/or its use.

APPENDIX H
INSTRUCTIONS FOR TEST ADMINISTRATION

Following are the instructions provided to the instructors of the conducting classes at each institution participating in the study. These instructions were the same for both the pretest and the posttest.

Instructions for Test Administration
First Suite in E-Flat - Gustav Holst

Instructor:
Please follow these instructions carefully when administering both the pretest and the posttest to your conducting class. All students, regardless of whether they are in the control or experimental group, should take this test at the same time and under the same conditions. Thank you for your participation in this study.

Items you will need

* A classroom with adequate seating, lighting, and writing surfaces
* An overhead projector and adequate screen
* A cassette player and adequate amplification system
* A watch or stopwatch with a second timer or other means of timing

Materials

In the packet labeled "Test", you will find the following items:
--Copies of the test, 2 copies for each student in your class (one for pretest, one for posttest)
--Two transparencies of score visual excerpts, labeled pages 1 and 2, for the second phase of the test (Score Reading)
--A cassette tape of score audio excerpts for the third phase of the test (Score Analysis)

Administration

PHASE ONE - SCORE ORIENTATION
With the class seated in their normal arrangement, please hand out the student test packets, and instruct the class to begin Phase One(Score Orientation). Please be sure each student includes their name in the space provided. Allow approximately 15 minutes for the class to complete this phase. At the end of the time period, please instruct the class to complete their work, and continue with Phase Two of the test (Score Reading and Score Analysis)

Again, please be sure each student includes their name in the space provided

PHASE TWO - SCORE READING
1. Place the transparency labeled page 1 on the overhead projector.
2. Cover the score excerpts with a blank sheet of paper so that none are showing
3. Turn on the projector and advise the class that you are ready to begin.
4. Uncover Excerpt One and begin 45 second timing
5. At the end of that time period, announce Excerpt Two, uncover this excerpt, and begin timing again.
6. Continue this process through Excerpt Five, then exchange the transparency labeled page 1 for page 2. Please be sure the page is covered before placing it in view of the students
7. Continue the process outlined above for Excerpts Six through Ten
8. Turn off the projector and place the transparencies back in the packet.

PHASE THREE - SCORE ANALYSIS

1. Place the cassette tape from the packet in the player with Side A ready to play.
2. Turn on the machine and press "Play".
3. As the volume adjustment audio excerpt begins, adjust the volume so that all may hear comfortably.
4. At the end of the volume adjustment audio excerpt, press "Pause" or "Stop".
5. Announce to the class that you are ready to begin.
6. Press "Play", and allow Score Audio Excerpts One through Ten to be heard. There will be approximately 10 seconds between each excerpt. A voice will announce the start of each subsequent excerpt. You may allow the tape to play until the end of test is announced.
7. Turn off the machine and place the tape back in the packet.
8. Take up all tests and place them in the folder provided. There is a separate folder for the pretest and posttest.

NOTE: The same procedure is followed for both the pretest and the posttest.

After the pretest, please place all test materials and completed tests in the proper packets and place them in a secure location in anticipation of the posttest to be given in approximately three weeks.

After the posttest, please place all test materials in the packet and send them to me using the return container provided. Please feel free to include any written comments you may have about the program or the test for my benefit. If possible, please also include a copy of your coordinating course syllabus. Once again, thank you for participating in this study.

APPENDIX I
INSTRUCTIONS FOR COMPUTER PROGRAM ADMINISTRATION

Following are the instructions provided to instructors of the conducting classes at each institution regarding the computer program administration.

INSTRUCTIONS FOR COMPUTER PROGRAM ADMINISTRATION

Prior to any other action, and without their knowledge, please assign the class to experimental or control groups using the following method: In alphabetical order assign student one to the control group, student two to the experimental group, continuing to alternate in this manner. Please prepare a confidential listing of the assignments and include it in the packet when it is returned.

After the class has been randomly assigned to the groups and the pretest has been taken, please distribute the program materials to the experimental group.

Materials

In the packet marked "Program", you will find the following items:
--A compact disk (Telarc Sharon CD 54014) of Frederick Fennell conducting the Cleveland Symphonic Winds (Please keep this CD or donate it to your music library collection upon completion of this study.)
--One (1) instruction sheet for each student (please check to see that there are enough copies for Group Two)
--One (1) student log for each student in Group Two (please check to see that there are enough copies for Group Two)
--Two 3.5" computer disks of the computer-assisted instruction program, one a primary and the other a backup copy. The program is self-extracting and will load onto the hard disk(s) by double-clicking on the icon viewed when the disk is opened.
--A disk containing the necessary fonts, if your music lab computers do not have these already installed. Please check with your lab administrator, and have these items installed on the computer(s) that will be used.

Other items you will need

--An adequate number of Macintosh computers with CD-ROM drives and either headphones or speakers for sound output.
--A central location at which the CD may be checked out for assignment by the students (Band Office, Music Library, Music Computer Lab, etc.)

After distributing these materials, please stress to the students the importance of completing two sessions per week for the next three weeks and entering each session on their student log sheet.

During the three-week period, please encourage the students to keep up their sessions and log the times.

At the conclusion of the three-week period, please collect the CD and the student log sheets. Place the log sheets in the return container with the pretest materials. Administer the posttest in the manner described above, and place these materials in the return container. Affix the label provided and send the container to me. Thank you very much for participating in this study. I hope it has been beneficial to your students and little trouble for you.

Checklist for return

Log Sheets
Pretest packet with all tests enclosed
Posttest packet with all tests enclosed
Listing of student groups assignments and course syllabus

APPENDIX J
STUDENT TIME LOGS - EXPERIMENTAL GROUP

The following table displays the time spent on each of the six required sessions by the Experimental group. The order of subjects does not coincide with the order displayed in the raw scores. The average times for each student are displayed at the end of each row. The average times for each session are displayed at the end of each column. Averages are calculated only on the number of responses. A dash (-) indicates no response.

Table 17 Student Time Logs

ID	Ses 1	Ses 2	Ses 3	Ses. 4	Ses. 5	Ses 6	Avg.
AC1	35	20	20	30	25	20	25
AC2	35	20	20	20	20	20	22.5
AC3	25	25	25	30	25	15	24
MSU1	25	15	10	15	15	20	17
MSU2	50	30	30	25	25	25	22.5
MSU3	45	35	40	15	20	20	29
MSU4	20	20	20	20	20	20	20
MSU5	35	45	70	80	80	35	57.5
MSU6	30	15	30	30	30	30	27.5
MSU	50	45	60	45	60	45	51
MSU	50	40	15	10	10	15	23
WKU1	10	15	30	25	15	15	17.5
WKU2	20	15	35	20	10	20	18
WKU3	25	15	20	25	15	20	20
WKU4	25	15	20	15	15	15	17.5
WKU5	30	30	20	15	20	20	22.5
WKU6	20	20	20	20	15	15	18
UF1	60	60	60	50	35	30	49
UF2	50	45	25	25	25	-	34
UF3	-	-	-	-	-	-	-
UF4	-	-	-	-	-	-	-
UF5	-	-	-	-	-	-	-
Avg	35	28	30	27	25	22	27

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BIOGRAPHICAL SKETCH

Mark Edward Hudson is a native of Florida and began his musical instruction at Eastside High School in Gainesville, where he graduated in 1976. In 1981, after completing a BA in Music Education at Harding University in Searcy, Arkansas, he returned to Gainesville. During the next thirteen years, Mr. Hudson served as Director of Bands and Choral Activities at Santa Fe High School, Director of Choral Activities at Buchholz High School, and Director of Bands at Fort Clarke Middle School. He also received a Graduate Teaching Assistantship with the University of Florida Bands, completing a Master of Music in wind band conducting in 1989. After completing coursework for the PhD, Mr. Hudson returned to Harding University as a member of the music faculty and Assistant Director of Bands. At Harding, he taught a variety of courses including Ear Training, Choral Conducting, Music Appreciation, Secondary Music Methods, Brass Skills, and Applied Brass. He also conducted the Musical Orchestra and the Show Choir, and supervised student teachers. Upon completion of the terminal degree in 1996, he accepted a position at Limestone College in Gaffney, South Carolina as Director of Instrumental Music Education and Department Coordinator. Mr. Hudson is married to the former Ann Hummel.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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